July 1948

TECHNOLOGY REVIEW

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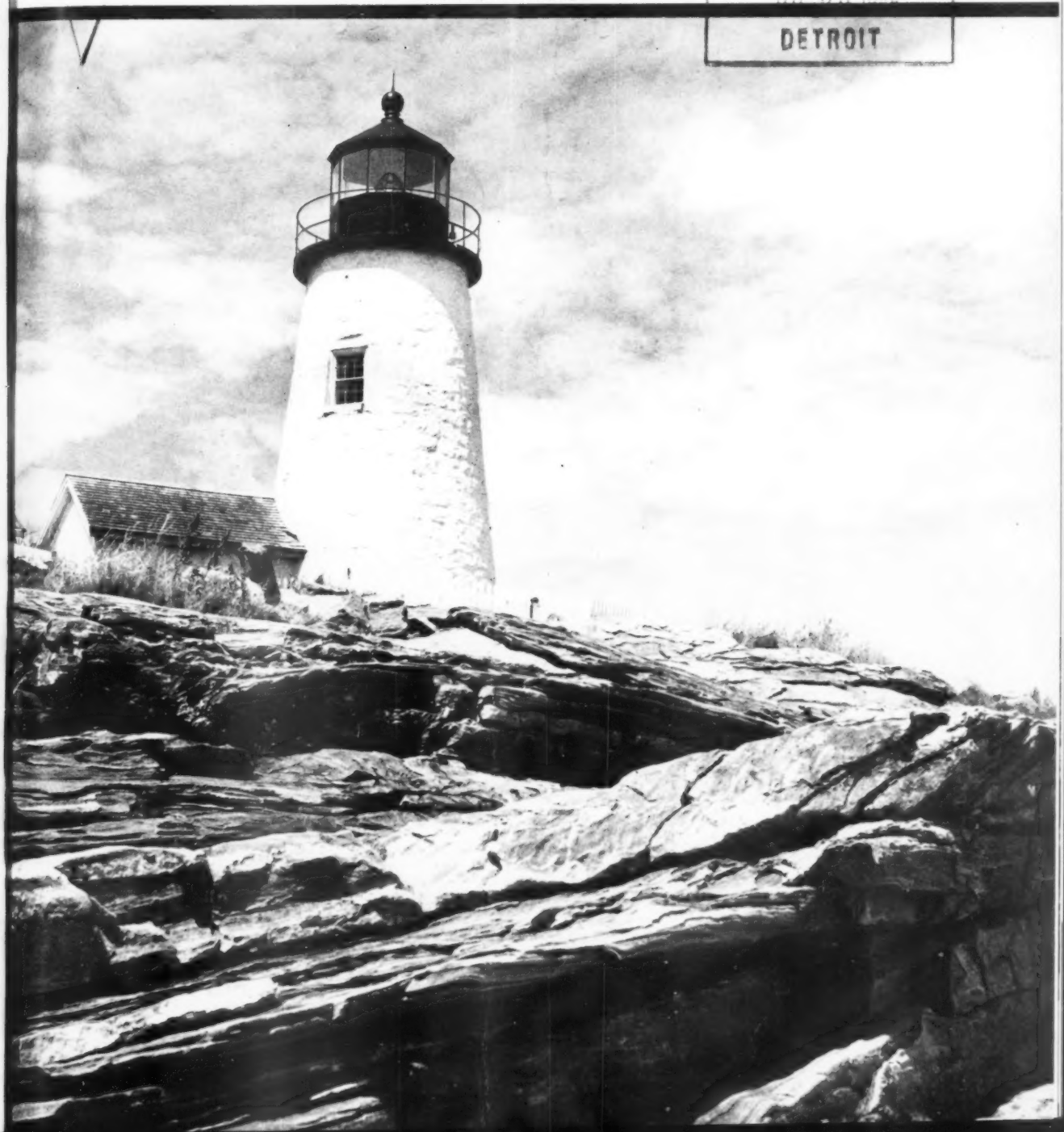

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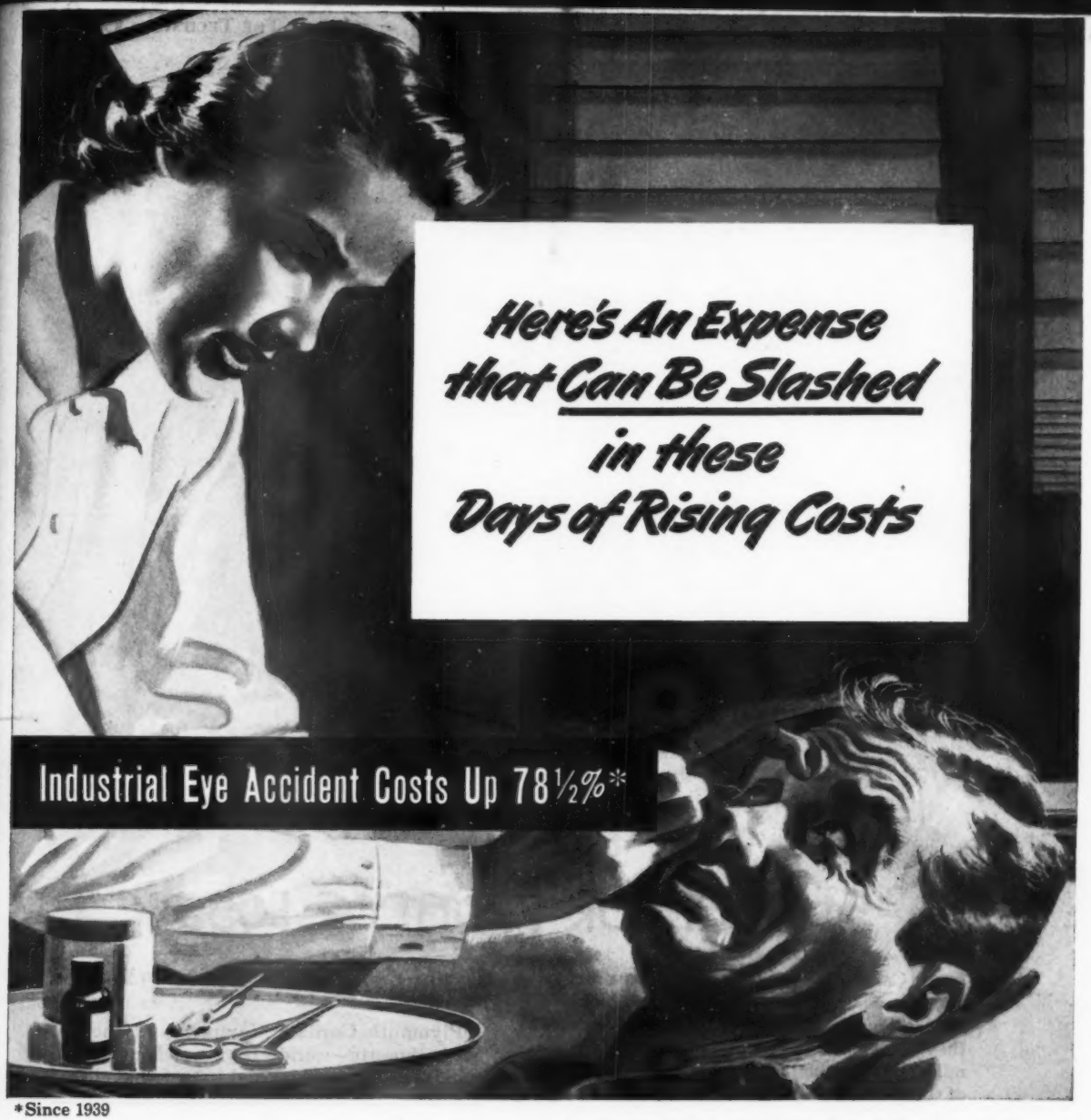

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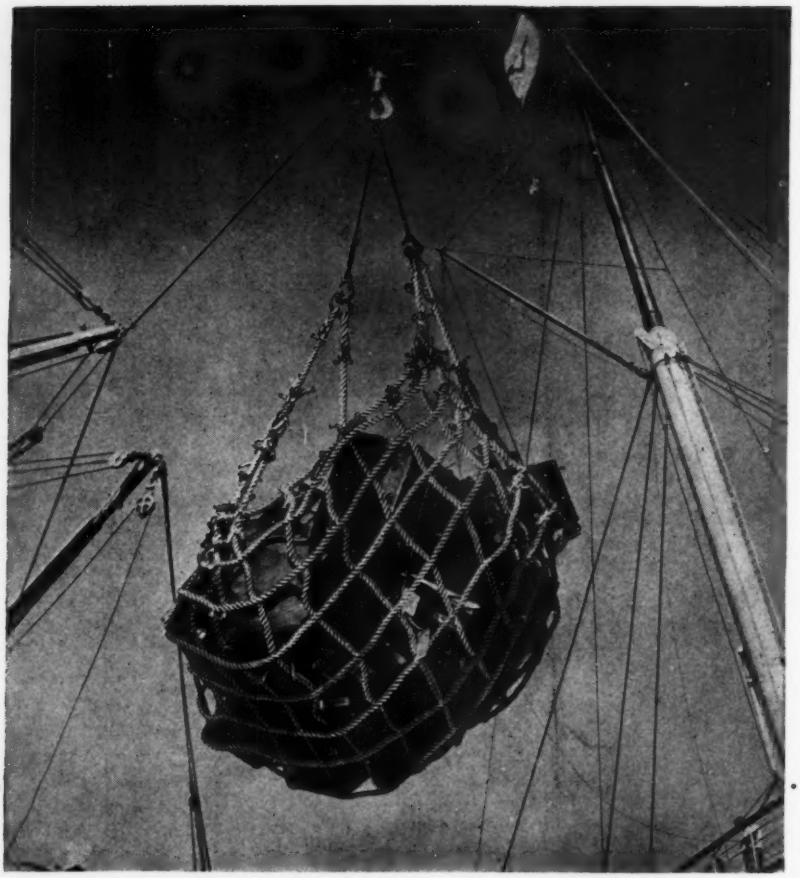
THE TECHNOLOGY REVIEW, July, 1948. Newsstand Edition. Vol. L, No. 9. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.



50 FEET FOR PROFIT OR LOSS!

From Cadiz and Calcutta the ships come in, and from Hong Kong, Cape Town, Helsinki, Rio, Bordeaux. Hull down with valuable cargo, they have plowed across thousands of deep sea miles. But the final 50 feet are the most critical of the entire voyage, for the safety of the *cargo*.

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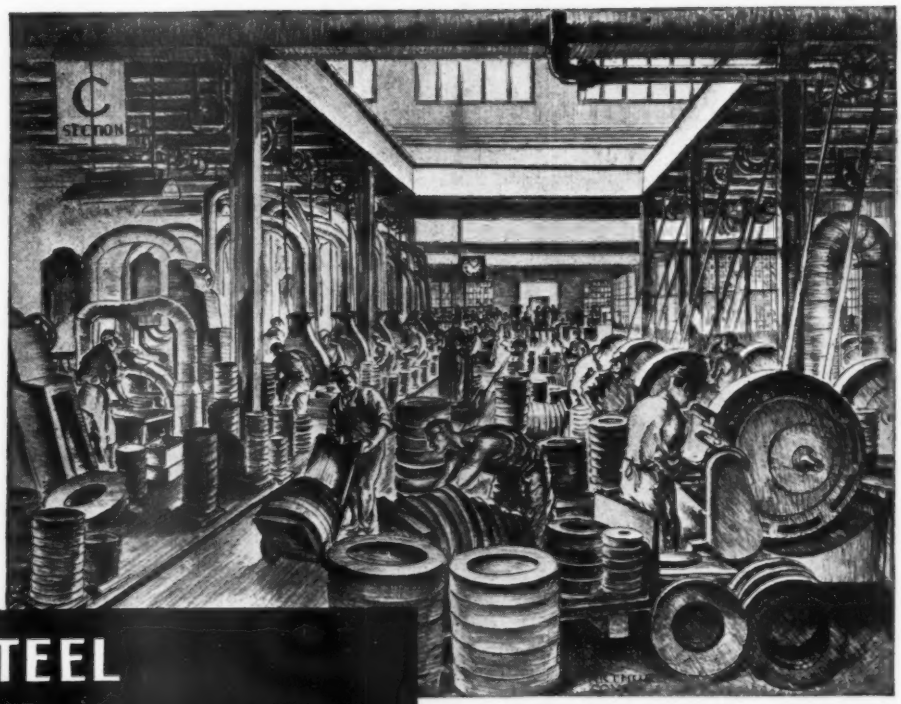

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YOU normally think of the grinding wheel as shaping steel. But in the Norton truing rooms it's just the opposite. There you see grinding wheels being shaped by steel.

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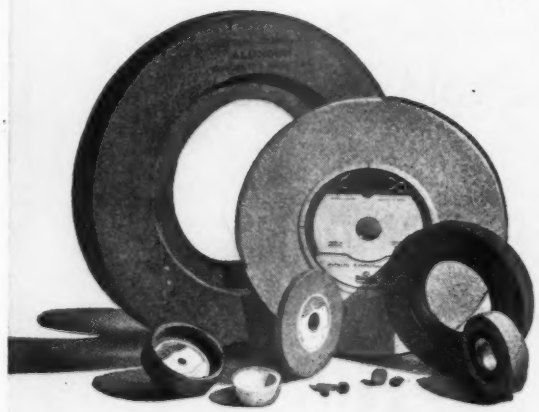

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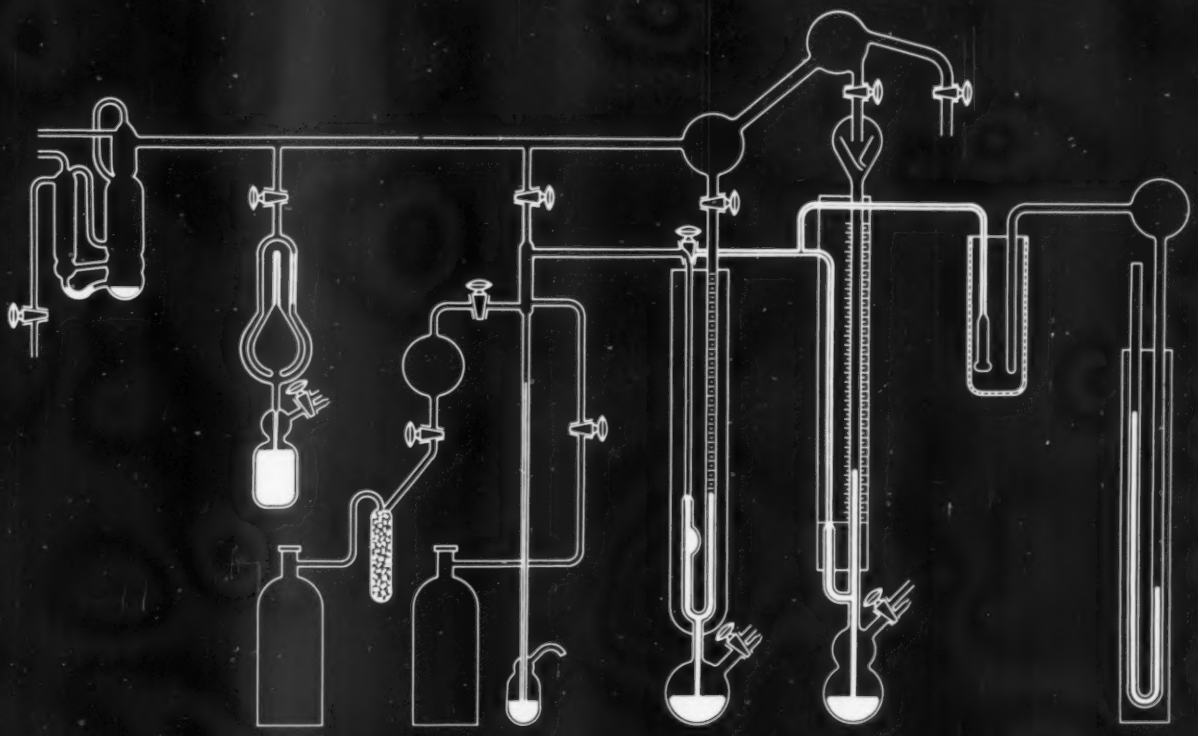

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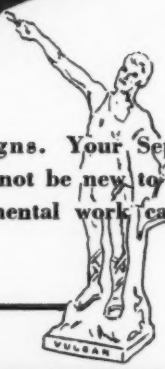

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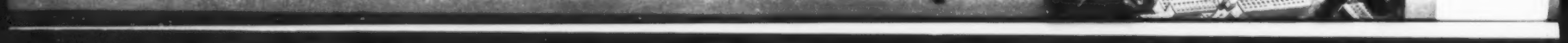

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THE TABULAR VIEW

Unfinished Business. — On page 444 of the June issue of The Review there appeared the Technology Crossword Puzzle by JOHN M. KECK, '23. Should there be any who had difficulty in fitting the right letters to the appropriate squares, however, the pathway to success, on page 542 of this issue, may provide a welcome conclusion to unfinished business.

Energy Resources. — Taken as a whole, the world has ample natural resources of energy for generations to come. Such is the contention of ROBERT T. HASLAM, '11, Vice-president and Director of the Standard Oil Company of New Jersey, whose symposium address appears on page 493 under the title "World Energy and World Peace."

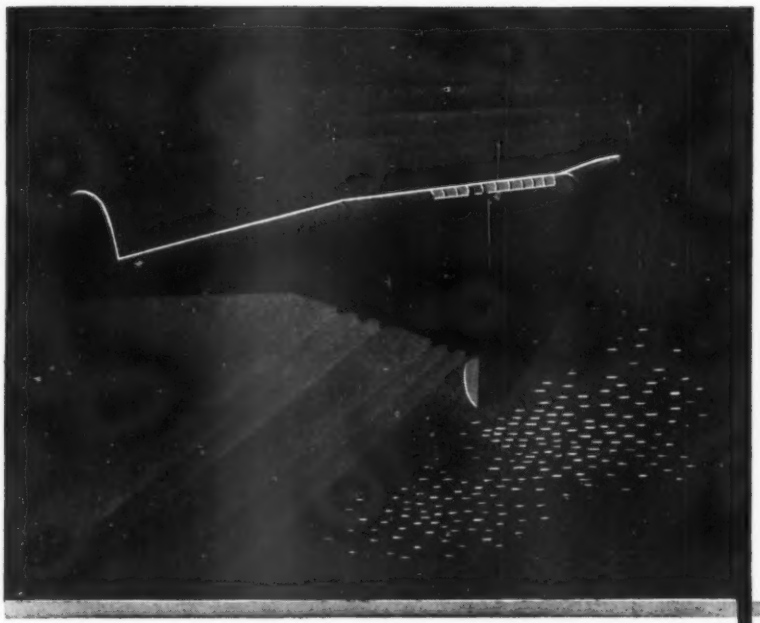
International Co-operation. — In demonstration of his convictions, the RIGHT HONORABLE CLARENCE D. HOWE, '07, Minister of Trade and Commerce in Canada, traveled from Ottawa to Cambridge to deliver his symposium address "Defense, International Co-operation, and Peace" which appears on page 497. Beginning as an assistant in civil engineering at M.I.T., after his graduation from the Institute, Mr. Howe's career as engineer turned public servant provides rich experience from which are drawn the sage conclusions recorded in this issue.

European Recovery. — Recently promoted to professor of economics after being associate professor at M.I.T. for six years, RICHARD M. BISSELL, JR., has been given unusual opportunity to practice his subject under crucial circumstances, as newly appointed director of operations, Economic Co-operation Administration, European Recovery Program. His symposium address, "The Economic Means to Peace," is presented in substance on page 499.

Domestic Education. — Unlike most graduating classes the Class of 1948 had the rare good fortune to have its commencement address delivered by a winner of the Nobel Prize, who, in accordance with family tradition of serving in academic circles, is chancellor of Washington University. The profound thoughts on the training and responsibilities of collegians, expressed in the commencement address of ARTHUR H. COMPTON, are recorded on page 501.

Into the World. — As his valedictory address to the graduating class, PRESIDENT KARL T. COMPTON took a stimulating but realistic stand in discussing the urge for self-improvement which characterizes man. His address to the graduates appears on page 504.

The Review is not published during the summer months following July. This issue, therefore, concludes Volume 50. Number 1 of Volume 51 will be published on October 27 and dated November. Readers who bind their copies are reminded that if they possess nine issues of Volume 50, their files are complete. An index to the volume will be ready on September 30 and will be supplied post free upon request.



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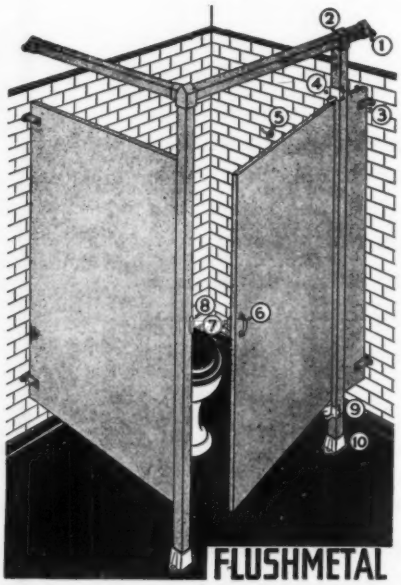

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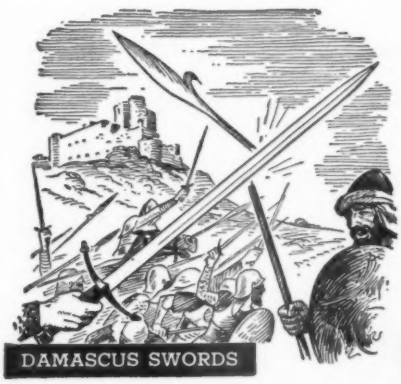
INDEX TO ADVERTISERS

July, 1948

Advertiser	*Page*
Ainsworth Lighting, Inc.	543
Albert Pipe Supply Company, Inc.	549
A. K. Althouse and Company	536
American Bosch Corporation	486
American Optical Company	469
American Optical Company, Scientific Instrument Division	533
The Barbasol Company	544
W. J. Barney Corporation	482
H. K. Barrows	551
Beech-Nut Packing Company	545
Boston Manufacturers Mutual Fire Insurance Company	521
Brockway Motor Company, Inc.	524
Brooks Brothers	538
Brown and Sharpe Manufacturing Company	476
Buff and Buff Company	536
Godfrey L. Cabot, Inc.	473
Chauncy Hall School	550
Wallace Clark and Company	551
Clifford Manufacturing Company	531
Climax Molybdenum Company	477
William H. Coburn and Company	536
Combustion Engineering Company, Inc.	525
Converse Rubber Company	472
J. C. Corrigan Company, Inc.	546
The Cosma Laboratories Company	551
Diefendorf Gear Corporation	482
Doelcam Corporation	549
The Dwight Building Company	547
Eadie, Freund and Campbell	551
Electro Metallurgical Company	481
Electro Sun Company, Inc.	532
Fabric Research Laboratories, Inc.	551
Fay, Spofford and Thorndike	551
Flush-Metal Partition Corporation	478
Frazier-Simplex, Inc.	483
General Radio Company	Outside Back Cover
Gilbert Associates, Inc.	551
The Goodyear Tire and Rubber Company	488
W. C. Hamilton and Sons	547
Hart Products Corporation	534
Harvey Metal Corporation	Inside Front Cover
Healy-Ruff Company	480
Hevi Duty Electric Company	528
Higgins Ink Company, Inc.	480
Holmes and Narver	547
Huntington School	550
Hydraulic Equipment Company	547
Industrial Rayon Corporation	539
Jackson and Moreland	551
The Kuljian Corporation	551
Leonard Construction Company	550
The Liquid Carbonic Corporation	530
Lord Electric Company	546
N. A. Lougee and Company	550
The Lummus Company	529
McCreery and Theriault	549
Manufacturers Mutual Fire Insurance Company	535
Marlboro Wire Goods Company	536
Martin-Hubbard Corporation	552
Mason-Neilan Regulator Company	519

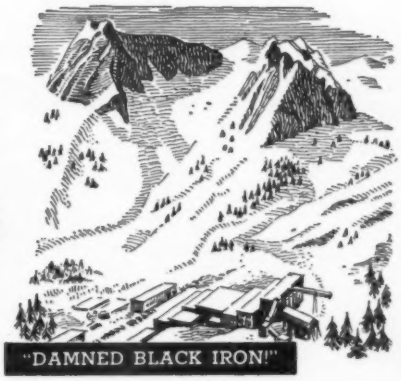
(*Concluded on page 482*)

THE STORY OF TUNGSTEN



DAMASCUS SWORDS

1 Tungsten has been found in medieval Damascus swords—so hard they could cleave iron spears at a blow, so keen they could cut floating gossamer, so elastic they would spring back to shape after being bent to a right angle. Yet it is only for about 50 years that tungsten has been known as a valuable alloying metal.

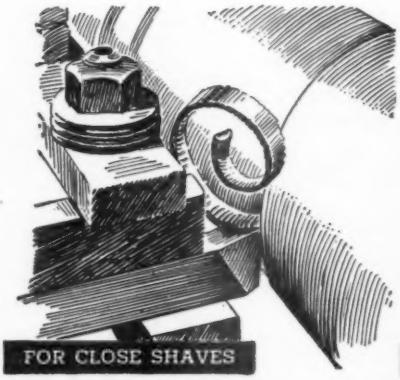


"DAMNED BLACK IRON!"

2 The exciting flash of gold was the dream of miners in gold rush days. They cursed when their pickaxes rang against a stubborn black rock—one of the tungsten ores, which has since sold for as much as gold ores. Tungsten ore is mined in the United States and many other countries throughout the world.

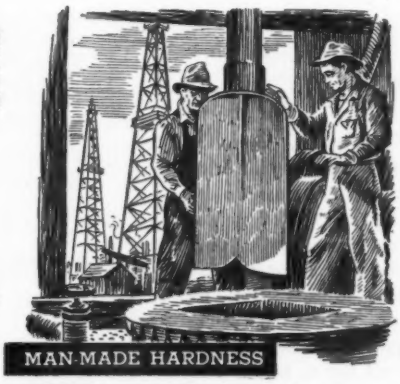
HOT AND HEAVY

3 Tungsten (which is Swedish for "heavy stone") gets hotter than any other metal before it melts—6,100° F. That's why it is used in electric lamp filaments and has many valuable industrial applications where high heat resistance is needed. Electromet produces pure tungsten powder, ferrotungsten, and calcium tungstate.



FOR CLOSE SHAVES

4 In cutting tools of high-speed steel and tungsten carbide and in the well-known HAYNES STELLITE non-ferrous alloys, tungsten produces a hard edge that stays hard even under extreme friction and high temperatures. Tungsten has other important uses, such as in the heat-resisting metals of gas turbines and jet engines.



MAN-MADE HARDNESS

5 Nature made the diamond, but man has created something almost as hard —tungsten carbide. This highly abrasion-resistant material is used for dies and tools and as a welded deposit on parts exposed to extreme wear. For instance, this tungsten alloy applied to drill bits enables oil men to drill wells almost three miles deep.

Help Wanted?

If you need help on some specific application of ferro-alloys or alloy steels, let Electromet work it out with you. Our modern, completely equipped research laboratories at Niagara Falls, New York, are staffed by men who have had years of experience in helping ferro-alloy users solve problems that arise in their plants and in the markets served by them. You can learn more about this unique service by writing to our Technical Service Department for the booklet, "Electromet Products and Service."

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Index to Advertisers

(Concluded from page 480)

Advertiser	*Page*
Frank Massa	551
Moran, Proctor, Freeman and Mueser	551
The Murray Printing Company	548
National Company, Inc.	527
William D. Neuberg Company, Inc.	546
The New England Trust Company	537
Norton Company	471
Palmer Russell Company	551
Phelps Dodge Copper Products Corporation	475
Pilot Packing Company, Inc.	520
Plymouth Cordage Company	470
Poor and Company	518
Precision Products Company	550
Raybestos-Manhattan, Inc. (Manhattan Rubber Division)	Inside Back Cover
Maurice A. Reidy	551
Revere Copper and Brass, Inc.	517
Rogers Peet Company	540
The Rumford Press	534
Harold J. Ryan, Inc.	549
Samson Cordage Works	530
Sandee Manufacturing Company	479
Sawyer Construction Company	526
Scully Signal Company	548
Simplex Wire and Cable Company	532
Sinclair Refining Company	522
Standard Oil Company (Indiana)	542
Starkweather Engineering Company	551
The L. S. Starrett Company	482
State Street Trust Company	476
Stone and Webster Engineering Corporation	487
Syska and Hennessy, Inc.	550
The Taft-Peirce Manufacturing Company	484
Thomas Taylor and Sons, Inc.	541
The Tredennick-Billings Company	546
Union Carbide and Carbon Corporation	481
Union Oil Company of California	485
Boris M. Volynsky Manufacturing Company, Inc.	550
The Vulcan Copper and Supply Company	474
Westinghouse Electric Corporation	523

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Do the oil companies "exploit" our natural resources?

1. Every so often someone comes up with the old cry that the oil companies are "exploiting" America's natural resources. Invariably they point out that since those resources *belong* to the American people, the oil industry should be *owned* by the people—that is, government-owned and operated.

2. If the oil companies were actually taking the oil resources of this country and *making off* with them, this argument might have some merit. But it so happens that 92% of the oil produced in this country is *consumed* by the American people. Even the 8% that is exported is almost exactly balanced by imports.

3. So the oil that *belongs* to the American people actually *goes* to the American people. The only difference is that the American people pay *private oil companies* for getting the oil out of the ground—and making useful products of it—instead of paying their *government* for doing the job.

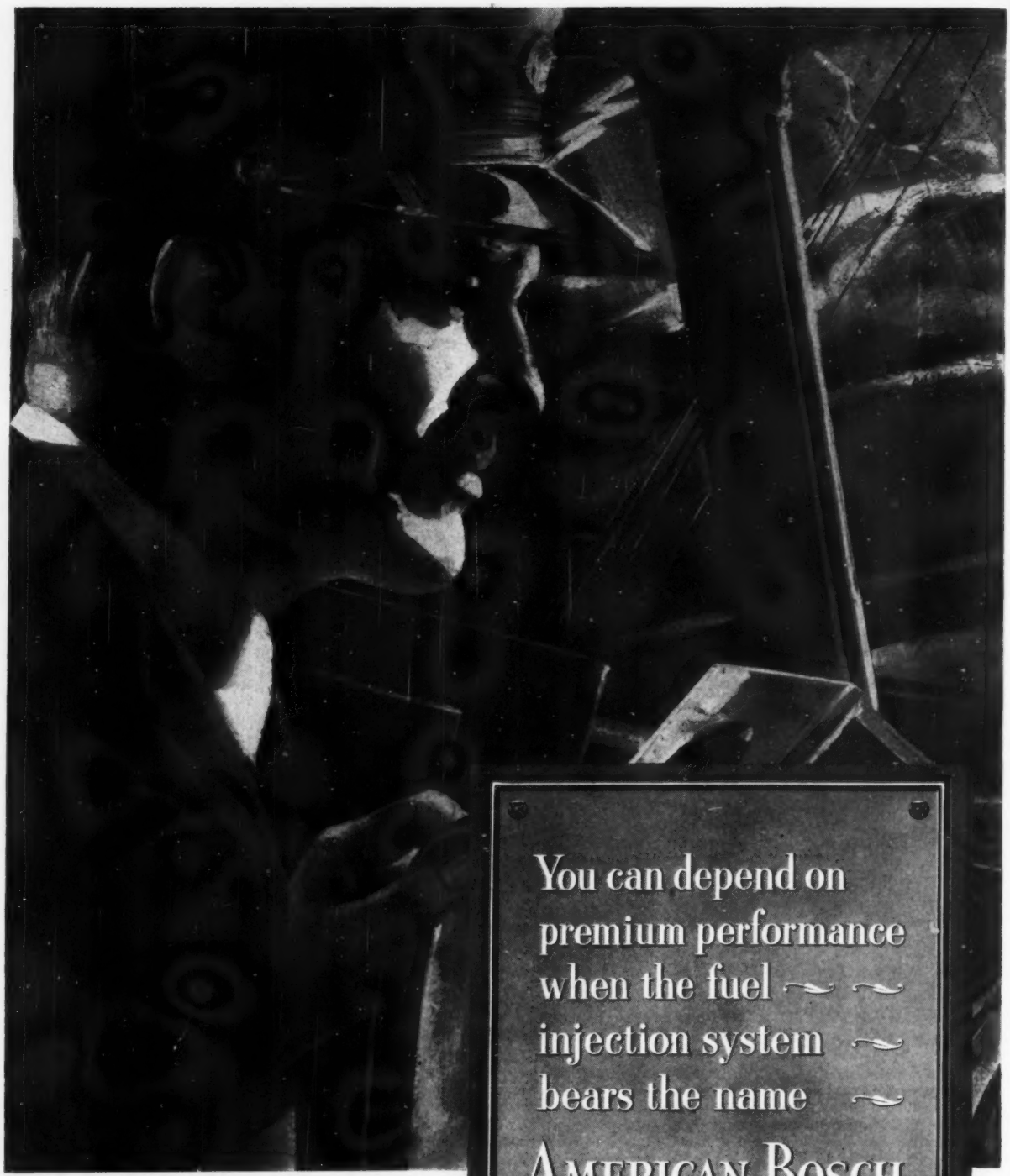
4. Last year, for example, Union Oil Company produced, refined and distributed 2 billion, 12 million gallons of petroleum products for the American people. The total profit received by the company for performing this job amounted to just 9/10¢ per gallon. Of this 9/10¢ only 3/10¢ was paid out in dividends to the stockholders; 6/10¢ was plowed back into the business.

5. In other words, one group of Americans—our customers—paid another group of Americans—our employees and stockholders—for furnishing them with petroleum products; just as Union Oil people pay farmers for furnishing them with food. When all the out-of-pocket costs of doing the job were met, and the employees' wages were paid, the stockholders got 3/10¢ per gallon for financing the operation.

6. So theoretically, even if Union Oil were government-owned—and operated as efficiently as private citizens operate it under a competitive system—the *maximum* "exploitation" that could be eliminated would be 3/10¢ per gallon. In actual practice, however, we all know this theoretical saving would be offset many times over by the inefficiencies of government operation. So the argument makes about as much sense as saying that the government should own and operate all farms.

UNION OIL COMPANY
OF CALIFORNIA
INCORPORATED IN CALIFORNIA, OCTOBER 17, 1890

This series, sponsored by the people of Union Oil Company, is dedicated to a discussion of how and why American business functions. We hope you'll feel free to send in any suggestions or criticisms you have to offer. Write: The President, Union Oil Company, Union Oil Building, Los Angeles 14, California.



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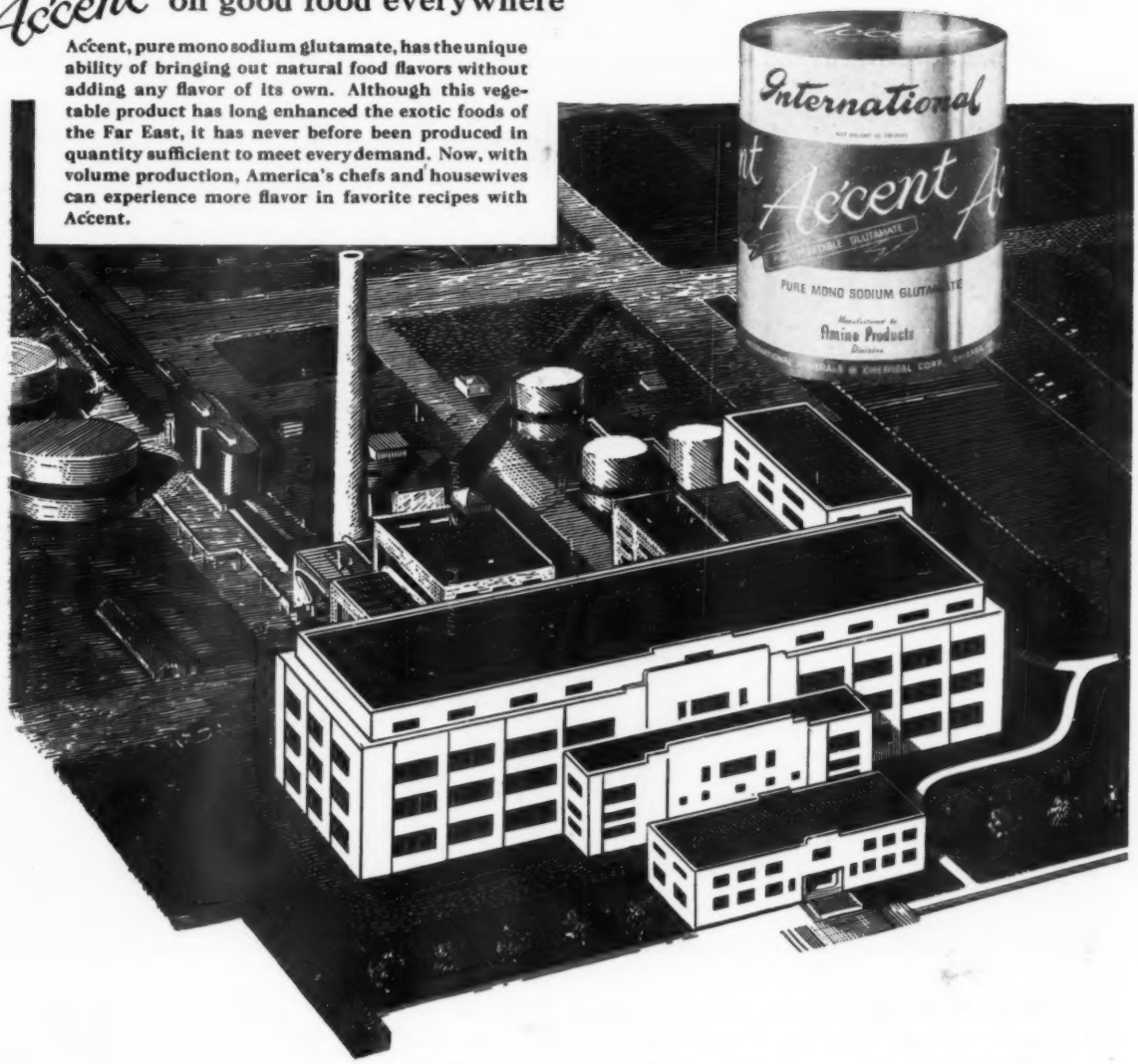

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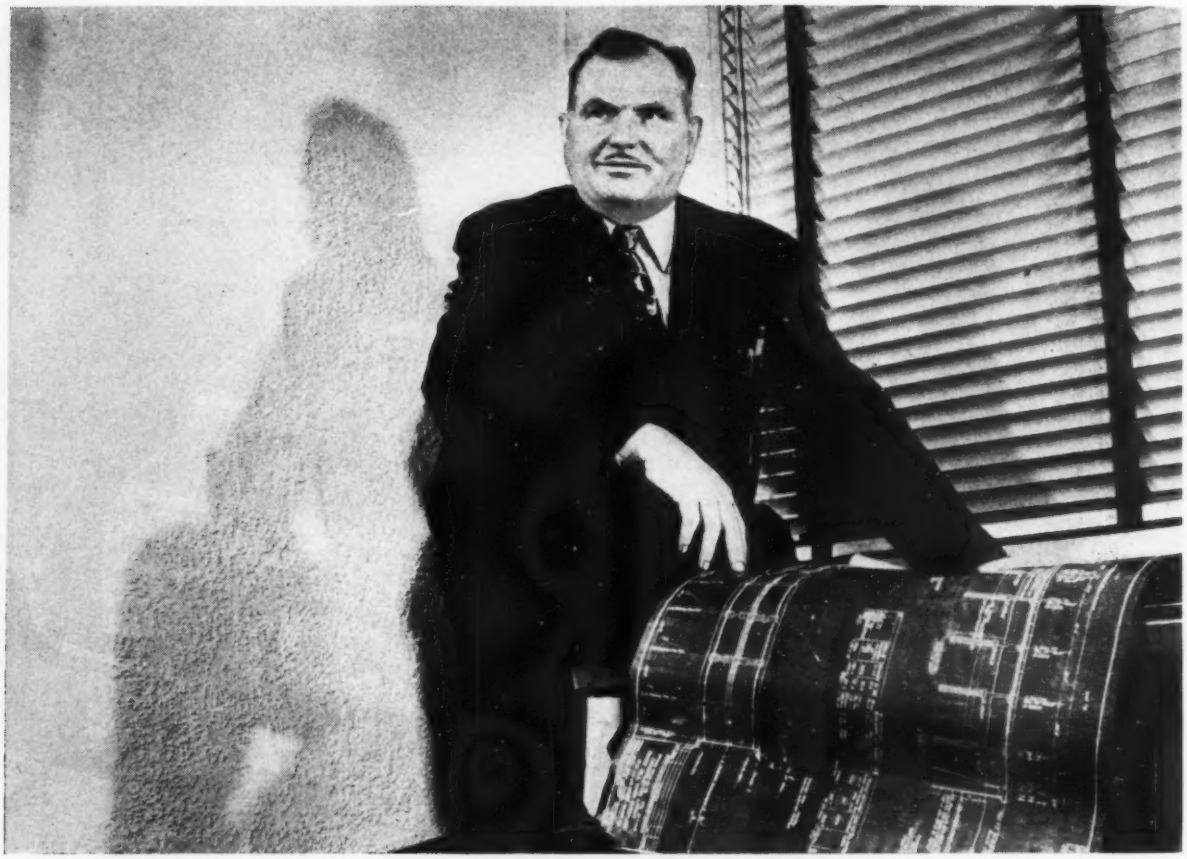

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VOL. 50 No. 9

THE TECHNOLOGY REVIEW

TITLE REGISTERED, U. S. PATENT OFFICE

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Contents for July, 1948

PEMAQUID LIGHT • *Photograph by David W. Corson from A. Devaney, Inc.* . . . . . THE COVER

PHYSICISTS AND ADMINISTRATORS . . . . . FRONTISPIECE 490

WORLD ENERGY AND WORLD PEACE . . . . . BY ROBERT T. HASLAM 493
The world has ample energy resources for peaceful living but the primary energy need of the world is energy of the human spirit

DEFENSE, INTERNATIONAL CO-OPERATION, AND PEACE . . . . . BY CLARENCE D. HOWE 497
Peaceful co-operation between Canada and the United States proves that countries can live in mutual respect and peace

THE ECONOMIC MEANS TO PEACE . . . . . BY RICHARD M. BISSELL, JR. 499
The social tranquility necessary for world peace can be brought into being through increased productivity and by living within our means

EDUCATION FOR PEACE . . . . . BY ARTHUR H. COMPTON 501
We need to learn that liberty means freedom to do what one wants to do, consistent with the welfare of his fellows

THE URGE FOR A BETTER LIFE . . . . . BY KARL T. COMPTON 504
Education, creativeness, and service beyond what one is paid for are required of today's graduates

ALUMNI DAY, 1948 506
Means for aggressively waging peace is the theme underlying the 1948 reunions in which record numbers join the movement "back to Tech"

THE TABULAR VIEW • *Contributors and Contributions* 476

INDEX TO ADVERTISERS 480

THE TREND OF AFFAIRS • *News of Science and Engineering* 491

THE INSTITUTE GAZETTE • *Relating to the Massachusetts Institute of Technology* 513

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The largest class ever to be graduated from M.I.T. had the unusual honor of being addressed by two brothers of a distinguished American family during commencement exercises on June 11: Karl Taylor Compton, President of the Institute, and Arthur Holly Compton, Chancellor of Washington University, and 1927 winner of the Nobel Prize in physics.

THE
TECHNOLOGY
REVIEW

Vol. 50, No. 9 July, 1948

The Trend of Affairs

Scientific Froth

IT is a simple enough matter to make a fixed model of a crystal with the atoms (little, black balls) neatly strung on wires in perfect geometric order. Producing a model that shows some of the dynamic behavior of a crystal, including its response to imperfections, is quite another problem however. It has been tried with floating magnets and with floating disks, but the frictional forces between such atom models have often been excessively large. Worse still, it was impractical to provide a sufficiently large number of "atoms" to duplicate the conditions in a real crystal. Nevertheless, such atom models have been exceedingly useful in obtaining a qualitative picture of the behavior of submicroscopic particles, as the suspended magnets of J. A. Ewing so well illustrated, half a century back, in yielding a clue to the elementary particle basis of magnetism.

Sir William Bragg was also among those who played with the floating magnets and was impressed with the limitation which such macroscopic models impose when used to represent submicroscopic phenomena. Another member of this famous family was to achieve greater success. In co-operation with J. F. Nye, Sir Lawrence Bragg, son of Sir William, has recently discussed a method of constructing crystal models that overcomes many of the former limitations.

These models, both two and three dimensional, are built up of tiny bubbles, their diameters ranging from 0.08 to 0.004 inch (2.0 to 0.1 millimeters). This is a very orderly froth, however, a given model being made up of as many as 100,000 bubbles which are of the same size to within narrow limits. Accurate control of diameter is one of the principal factors in the startlingly realistic behavior of the bubble rafts, and it is interesting to observe that the occasional rogue or "foreign" bubble, of different size, generally is found in the grain boundary where it disturbs the normal arrangement of the atoms for large distances around it.

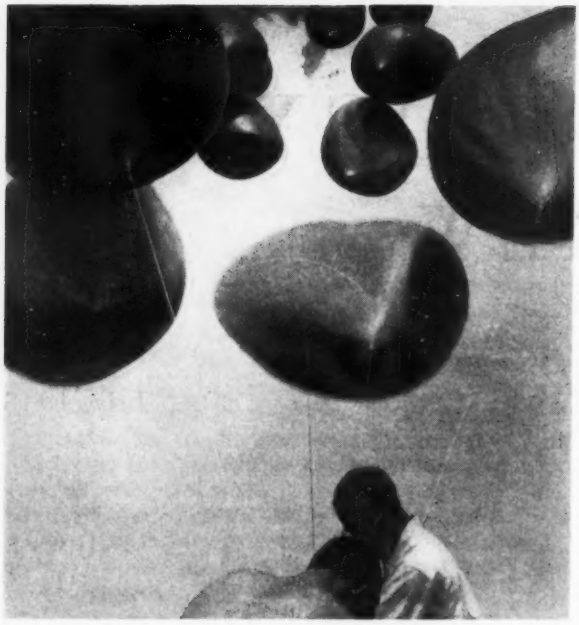
The bubbles are blown by means of a steady flow of air through an orifice submerged in a tray of the bubble solution. For the benefit of those who wish to blow bubbles in an approved scientific manner, the liquid is a water solution of oleic acid, triethanolamine and glycerin. The tiniest bubbles were produced by whirling the solution past the orifice at high speed. A helpful feature of these bubbles is their rather long life which may be up to an hour or even more.

When one of these bubble rafts is viewed obliquely, it is said to have a remarkable resemblance to the polished and etched surface of a metal specimen. The raft will deform, under stress, in a manner analogous to the behavior of particles in a metal. When strained beyond the elastic limit, the rows of closely packed bubbles will begin to slip over one another, in steps of one bubble diameter, or as Bragg and Nye put it, one "interatomic" distance. But the entire row does not simultaneously slip over its neighbor. The disturbance starts at a point where an extra bubble has crowded into the normal spacing, and then slowly flows like a wave across the row, sometimes taking several seconds to cross a "crystal." In many respects the phenomenon is similar to the plastic flow in highly stressed metals. Behavior analogous to recrystallization and annealing can also be observed.

If bubble blowing continues after the tray of solution is completely covered, the bubbles will accumulate in multiple layers, duplicating the spacing and some of the properties of simple three-dimensional crystals.

Positive Notes on Cosmic Rays

SINCE the first observation at the beginning of the century that very fast-moving particles are constantly traversing the atmosphere and causing ionization (the splitting off of electrons from atoms in the air), cosmic rays have received extensive study by physicists. The tremendous interest in cosmic rays arises not only from the need for learning their origin in the universe, but be-



Thirteen balloons are required to lift 30 pounds of instruments nearly 19 miles above the earth for studies of cosmic rays by Professor Bruno B. Rossi and Robert I. Hulsizer, Jr., G, research associate, of the Laboratory for Nuclear Science and Engineering at M.I.T. Their research reveals that the primary cosmic rays consist of less than four per cent electrons — knowledge that will enable scientists to better estimate the origin in interstellar space of these mysterious rays and how they achieve their energies of millions of billions of electron volts.

cause these incoming particles have energies of millions of billions of electron volts. Cosmic rays, therefore, serve as natural projectiles of enormously higher energy than any artificially produced particles created in experiments engineered by man. In their descent through the earth's atmosphere, the primary particles, whatever they are, produce electrons, protons, neutrons, mesons, and gamma rays by bombardment. All of these secondary particles have energies comparable to those of the primary rays. Thus does nature provide an atomic particle accelerator of extremely high energy. By correlating cosmic-ray observations with the elementary products produced by man-made accelerators, knowledge of the ultimate constitution of matter may be acquired.

One of the earliest questions investigated was whether or not the cosmic-ray phenomena are caused by the presence of radioactive atoms in the atmosphere or the earth, or by particles that originate outside the earth's atmosphere. By 1926, experiments using balloon-carried apparatus had shown that the ionization effects increase with altitude almost to the top of the earth's atmosphere. Hence, the origin of the primary cosmic rays was definitely established to be outside the earth and its atmosphere. It was similarly established that the sun is not the point of origin. In 1926, the observation of cosmic rays in South America, when the Milky Way was not visible, indicated the origin of the primary rays is beyond the Milky Way.

Whether the primary particles of cosmic rays carry a charge, like the electron or proton, or are neutral, like the neutron, was another matter to be experimentally studied. If the primary radiation is charged, a geomagnetic effect (a phenomenon which concerns variations with latitude in the number and energy distribution of cosmic rays) would be expected. By 1930 this effect had been definitely shown to exist and was considered proof that the primary particles are charged.

For many years some scientists have maintained that the primary rays are mostly electrons, but in 1930 the prediction of Bruno B. Rossi, Professor of Physics at M.I.T., and the verification in 1933 of an East-West variation in cosmic rays indicated the possibility that the major fraction of the primary cosmic rays might be positive in nature in which case they could not consist of the negatively charged electrons. At that time protons were predicted (and are still believed) to be the positive component of the radiation.

High-altitude research at M.I.T. now reveals that primary cosmic rays — the particles which constantly bombard the earth from outer space — consist of less than four per cent electrons. Knowledge of the ratio of protons to electrons permits a calculation of the time of travel of the primary cosmic rays and hence of their point of origin in space, long a mystery of science.

The fact that primary cosmic rays consist of practically no electrons gives important support to the theory that protons, the nuclei of hydrogen atoms, are by far the major component of cosmic radiation. The discovery, however, raises the problem of how electrons of billions of electron-volts energy are produced in the first collisions of primary cosmic rays with the atmosphere, a phenomenon that is not explained by any process now known. The presence of extremely high-energy electrons in the upper atmosphere first led many scientists to believe they were part of the primary rays.

The research, which definitely disproves a contention held by some scientists over many years that electrons constitute a large share of the primary cosmic rays, was carried out by Dr. Rossi and Robert I. Hulsizer, Jr., of the Institute's Laboratory for Nuclear Science and Engineering. The studies, which have been going on since 1946, were carried out by means of balloon soundings at altitudes up to 100,000 feet, and with the aid of an instrument equipped Air Forces Flying Fortress.

In their research on the number of electrons in the primary cosmic rays, Dr. Rossi and Mr. Hulsizer employed a pulse-type ionization chamber developed during World War II for nuclear physics research. With this chamber a measurement of the number of incoming high-energy electrons was made with the aid of balloons at an altitude of nearly 19 miles, where only two per cent of the earth's atmosphere was above the instruments. It was at this altitude that measurements showed that the number of incoming high-energy electrons is less than four per cent of the number of primary cosmic rays.

The ionization data, as well as temperature and pressure measurements taken by the balloon-borne equipment used in these experiments, were automatically radioed to the home station in the Cambridge area. After attaining an altitude of about 30,000 feet, the balloon equipment was often carried away by winds of 70 miles per hour, or more, and ordinarily traveled over the earth's surface approximately 150 miles in five hours. Although a reward notice was always posted on the equipment of each flight, only a small percentage of the instruments sent aloft has been returned. The rest are believed to have landed in the Atlantic.

World Energy and World Peace

Properly Directed by Energy of the Human Spirit, Resources of Physical Energy Are Adequate to Make Possible World-Wide Peace

By Robert T. Haslam

Symposium Speaker

WAR'S drain on human and material values is beyond comprehension. Speaking of the material cost alone, Congressman Herter of Massachusetts recently stated that even for the peace-loving United States 85 per cent of all government expenditures since the founding of our republic down to the present time, have been in preparation for war, for war, or for the aftermath of war.

The phrase "Logistics of Peace" means to me that we are here looking at peace as a positive objective, capable of achievement by positive, well-organized approaches. The arresting quality of the phrase lies in the fact that it carries over to the side of peace a point of view which is normally associated with war. We are not here considering peace as a situation which exists when men are not waging war, but we are consciously taking the position that we intend to wage peace and that a condition of war will represent a failure to achieve our objective.

Widespread acceptance of this point of view in itself would be a great achievement. Peace must be waged. It must be built. It must be created out of some very difficult and uncertain material. We must organize for it, work for it, fight for it. It is entirely right to approach the subject dynamically as we are trying to do here.

Logistics is that branch of the military art which embraces the detail of transport and supply. It is apparent to us all that there is far more to the military art than logistics. Psychology has a tremendous role to play. The great military leaders have been well aware of the influence of politics on the conduct of a war.

It is certain, therefore, that logistics alone will not win for us the fight for peace. At the same time, one of the most familiar military quotations of our time reminds us that a very great help in winning is to "get there first with the most." This implies that logistics can play a vital part in our whole undertaking.

Anyone who attempted to present the causes of war would be certain to find himself lost in a jungle of arguments. But, at least we can agree on the direction in which we must move. We can say that our grand, strategic objective must be a world in which social, economic, psychological, and political conditions favor the growth of peace and do not favor the growth of war.

Let me try to describe such a "climate" in which peace seems likely to prosper. I would name four fundamental elements as necessary for the development and maintenance of world peace.

A world in which the people rule is the first condition to be fulfilled. I have no faith that we can have peace in a world where governments are not responsive to the will of the people. Thomas Jefferson said: "I know no safe depositary of the ultimate powers of society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion by education."

My second "climatic" condition is a world in which maximum freedom and opportunity are given to the individual. If we are to create a world at peace, we will need all of the energy and strength of which man is capable. This is a gigantic undertaking. If we are to create a better world, the economic tasks alone are tremendous, and will require of us all the energy, initiative, and enterprise we can muster across the face of the globe. To me it is evident that the greatest human driving forces yet developed are liberty and freedom of opportunity. Given a chance to be ambitious, and to create a better world for themselves and their families, men have proved, here in America, that liberty is a tremendous energizer.

Not long ago H. G. Weaver of General Motors Corporation said this: "Down through the ages, countless millions, struggling unsuccessfully to keep bare life in wretched bodies, have died young in misery and squalor. Then suddenly, in one spot on this planet, people eat so abundantly that the pangs of hunger are forgotten. Why did men die of starvation for six thousand years? Why is it that we in America have never had a famine?"

We owe much in this country to our natural resources and our fortunate geographical position. But we owe far, far more to the vast release of human energy which comes when the individual is free to work for his own advancement. Anything which destroys opportunity, whether it be a government, a cartel, a restrictive labor union, or legislation designed to block the individual, is not in the interests of peace.

As a third condition for peace, I think we must seek a world in which production is expanding. If we are to make ourselves a better world, we must increase the production of a great many things in order to raise the standard of living for hundreds of millions of people, particularly outside the United States, who are now at or below a subsistence level.

Half the people of the world today suffer all their lives from malnutrition and the diseases of malnutrition. It has been estimated that at least 500,000,000 people are born and die without ever having had enough to eat — even one day in their lives.

William O. Douglas, Supreme Court Justice, recently said: "The voice of America, if it is to be powerful among the masses of people, must do more than talk of the glories of democracy. If we want the hundreds of millions of the peoples of the world in the democratic ranks, we

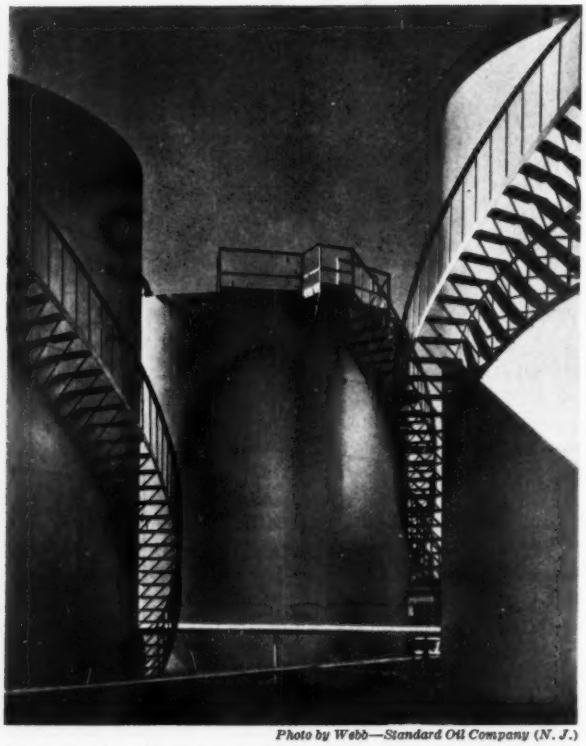


Photo by Webb—Standard Oil Company (N. J.)

It must be clear that the productivity necessary for a tranquil, peaceful world will require a great increase in the use of machines for the production of food, goods, and services. Has the world enough energy, in the form of fuel, for such a vast undertaking? Taking the world as a whole and considering all forms of fuel, the answer is "yes."

must show them the way with practical programs of social reconstruction . . . the real victory over communism will be won in the rice fields rather than on the battle fields."

I have a fourth condition to suggest. We need a world in which we keep the virtues of national feeling but begin to outgrow some of the vices of nationalism. There is no finer emotion than patriotism. It is good for the spirit of man to be attached to the land where he was born or where he has chosen to make his home. Love of one's own land is a great virtue.

What we must begin to move away from on a world scale, if we are to have a world unified in peace, is the debasement of the currency of national feeling. We must move away from the foolish excesses of sovereignty. It is when sovereignty becomes an instrument for aggression or supression that it is a world danger.

Certainly I do not intend at this point to get into any discussion of world government. I think, however, that the job of the future is to establish a co-operative system operating under law, and that a gradual change in our conceptions of national sovereignty everywhere is inevitable if we are to succeed.

In listing the conditions favorable to peace, I have very carefully refrained from saying that it is the job of our country to enforce these conditions on any other people. I do not believe that the peace we all want to achieve in the end is an enforced peace. I think what we are reaching for here is not the forcible suppression of wars but the purposeful elimination of conditions which will create wars.

We have, then, the long-term strategic objective of helping to create a better world which will breed peace rather than war. But we also have a short-term strategic objective. We must prevent the development, in the near future, of conditions which will destroy any hope of our achieving the long-term objective. We must have peace now, in order to lay the foundations of permanent peace in the future. We must prevent war now so that we will have time to develop a social, economic, psychological, and political climate favorable to peace. More specifically, the Western world must be strong enough over the near-term to make the outbreak of war on any world scale unlikely. We alone can give the world time to develop a climate favorable to permanent peace. It is a great and terrible responsibility. It is one we cannot avoid except by abdication. It is a challenge and a responsibility which I believe the American people have come to see and which they are now prepared to accept. To discharge this responsibility, the United States must not only remain strong industrially, but it must increase its strength.

But it is only within the last few decades, when it became apparent that the physical world had been shrunk by invention, that we have been able to consider any program for the world as a whole. Now it is possible, and it is now necessary, for us as scientists, managers, technologists, administrators, to consider seriously the development of plans to bring peace to the entire world.

This whole subject is too vast to be encompassed by any individual. What I propose to discuss is the single problem of supplying sufficient energy for the Herculean task. It must be clear that the productivity necessary for a world such as we are considering will require a great increase in the use of machines for the production of food, goods, and services. There is no other way, I think, to make the lands of the earth sufficiently productive. There is no other way to produce the goods and services which are required.

I would like to deal briefly and quite generally with the physical energy resources of the world to see if they are sufficient for this tremendous task, and speak briefly also on the human energy problems and potentials.

Let us begin with the question: Has the world enough energy in the form of fuel for such a vast undertaking?

Taking the world as a whole and considering all forms of fuel energy, the answer is "Yes." The world's fuel resources are more than ample. The quantity of the world's fuel reserves, expressed in heat units, is so large as to be almost beyond comprehension. At the 1947 rate of consumption, the world should recover enough energy ultimately from coal, crude oil, oil shale, tar sands, and natural gas, to last for approximately 2,000 years. Whether a better estimate is 1,000 or 3,000 years is of little importance. The known energy supplies are evenly distributed between the Eastern and Western Hemispheres, each possessing about 50 per cent of the world's resources. At the rate at which the world, the United States, the Eastern Hemisphere, and the Western Hemisphere are each using energy, each should ultimately recover from its own resources sufficient fuel to last for more than 2,000 years at present rates of consumption.

This estimate deals only with sources of energy currently in use. It is probable, of course, that in the period of 2,000 years significant discoveries of new and, to us, novel energy sources will be made. We are not now using solar heat on any extensive scale, for example. No one

yet knows all that we may expect from uranium and atomic fission. Any forward thinking must leave room for the possibility of a fundamental discovery of tremendous importance.

It is important to note that there is about 30 times more coal than oil in the total energy reserves of the world. Yet, as all of us here realize, energy in the form of oil and gasoline has uses and values for certain purposes far exceeding that of coal or any solid fuel. Oil and gasoline are fluids and may be transported, moved, and the rate of flow may be carefully regulated much more easily than in the case with coal, or any solid fuel. Consequently, oil fuels are of the greatest advantage when used in mobile units, such as automobiles, busses, trucks, tractors, railroads, ships, and airplanes — all of which have developed tremendously in the last few years and have influenced our lives to an extent previously undreamed of. Without such mobile units as the truck and tractor, the greatly increased industrial and farm production of the United States could not have been brought about.

Here in the United States, oil and natural gas provide 45 per cent of the total energy used for all purposes. Coal provides practically the same amount. Throughout the rest of the world, however, coal provides about four times as much energy as do oil and gas. That is to say, outside the United States 68 per cent of the energy comes from coal and 17 per cent of the energy from oil and gas. In the United States our economy is primarily geared to oil and gas, while foreign economies are geared to coal. Petroleum has made a tremendous and disproportionate contribution to the improvement in production of goods and the standard of living in the United States during the present century.

Since 1914, the use of oil and gas in this country increased about 700 per cent and these fuels have supplied 80 per cent of the added energy required for the entire industrial and farm expansion over the past 34 years. Except for the depression years, coal production in the United States has been substantially constant for the last 20 or more years.

This 34-year trend toward constantly increasing dependence on oil and natural gas, and the key importance of the United States to the whole program we are considering, make us ask: Have we oil supplies adequate for the task? The answer again is "Yes."

Today within the confines of the United States we have 22 billion barrels of proven reserves, or 12 times our 1947 consumption. Present reserves plus discoveries yet to be made in the United States have been projected at about 100 billion barrels, or 52 times our 1947 annual consumption. Present knowledge leads to the belief that the Eastern Hemisphere is richer than the Western Hemisphere in crude oil and it is estimated that ultimately about twice as much oil will be found in the Eastern Hemisphere as in the Western. It is thought that the world may have a total of about 800 billion barrels of recoverable oil in reserve. This is 264 times the 1947 annual world consumption in contrast with 52 times the 1947 annual consumption for the United States alone.

As these facts show, from now on we will have to augment from other sources our declining crude oil production. The first source, of course, is importation from those foreign countries which are more bountifully supplied than the United States. This is already taking place, and in 1947, the United States ceased being a net exporter of oil and became a net importer of oil. Importation of oil into the United States will probably increase steadily so that by 1952, it will probably reach upwards of 1,000,000 barrels of oil per day, a substantial amount of which may come from the Middle East.

In a world of peace in which trade restrictions are at a minimum, such dependence on foreign oil presents no special difficulties and this gives the people of the United States an additional reason for working wholeheartedly for peace.

However, economic and strategic reasons probably will dictate other solutions, such as getting a larger share of our energy requirements from coal. This may require price adjustments between these two fuels as well as technological developments in the use of coal com-

From now on we will have to augment, from other sources, our declining crude-oil production. Importation from foreign countries more bountifully supplied is our first source. In a world of peace in which trade restrictions are at a minimum, dependence on foreign oil presents no special difficulties. Economic and strategic reasons will probably dictate that we obtain a larger share of our energy requirements from coal. . . . There is sufficient energy in the United States in the form of coal, which we know how to convert to liquid fuels, to take care of all requirements for centuries to come.

Photo by Bubley— Standard Oil Company (N. J.)

mensurate with the technological developments over the past 50 years in the use of oil. For those energy uses for which liquid fuels are required (such as in automobiles, busses, trucks, tractors, airplanes, and so on), we can convert coal to gasoline and oil through processes that have already been developed. The operating cost of these processes is not unreasonable, especially when we consider the unique advantages of liquid fuels and liquid-fuel engines. Gasoline of exceptionally high grade can be made today from coal at an average cost of about six cents per gallon above present costs of gasoline from crude oil.

It should be pointed out, however, that the capital requirement for such energy conversion is tremendous. To produce only our present requirements of gasoline from coal would call for an expenditure of at least 20 billions of dollars and would require 11 million tons of critical steel. Therefore, the development of synthetic fuels from coal should take place gradually and slowly over as long a period of time as may be justified by economic conditions. Too rapid changes would place a strain on our economy that would be tremendous.

Therefore, we can say that there is sufficient energy here in the United States in the form of coal, which we know how to convert to liquid fuels, to take care of all requirements for centuries to come. In a world of peace without economic barriers, our problems are not severe.

Both the Eastern and Western Hemispheres have plenty of fuel resources. But now let's look at the use of energy by world areas. We will see that energy is not used by the people of the world for their own good on any well-balanced basis. The United States, with seven per cent of the world's population, uses 45 per cent of the world's fuel and annually consumes 246 million heat units (British thermal units) per capita. The people of the world, outside of the United States, while consuming 20 per cent more total energy, actually use only 10 per cent as much per person as we here in the United States. The only nation that even approaches us is Canada, whose per capita consumption is 82 per cent of ours. The European Recovery Plan nations use 25 per cent; Russia, 18 per cent; other European and North African countries, 15 per cent, of the United States per capita consumption. The balance of the world, comprising Asia, Oceania, and most of Africa, with 60 per cent of the world's population, uses only 10 per cent of the world's fuel and the per capita consumption is less than three per cent of that of the United States.

In consuming 10 times as much fuel per capita as the rest of the world, the United States produces two to four times as much goods per labor hour as even the more industrialized nations outside of the United States. As we examine these figures, we must be aware that a tremendous increase in energy production and consumption throughout the world, particularly outside of the United States, is necessary if the standards of living of the world are to be substantially increased. Here lies our problem. Obviously this is not going to be accomplished suddenly. We are going to achieve a world at peace only by working for it continually, persistently, and over a long period.

Now, let us look toward the future. In the first place, the world seems to be moving in the right direction, though slowly. Since 1914, or the beginning of World War I, the use of energy from all sources by the people of the United States has just about doubled, while in the world outside the United States the increase has been only one-half as fast. Wars have contributed very largely to this situation. However, trend estimates based on individual uses of each fuel, indicate that over the next 20 years, given peace, fuel consumption outside the United States will increase about three times as fast as within the United States. Even so, this will leave the people of the rest of the world consuming energy at the rate of only 29,000,000 British thermal units per capita — still less than 12 per cent of the United States rate. Here is where great improvement must be made if the people of the world are to have a notably better living standard.

It should be remembered, however, that many of the social, political, and educational factors which have held back the development of certain areas for centuries, are still a problem and will be for many more years to come.

From a logistical point of view however, it is imperative that energy sources in each and every area should be developed as much as possible, not only to raise living standards everywhere, but so that there may not be any undue economic strain on other areas, or any undue waste in transport. One of the greatest sources of petroleum energy in the world is the Middle East. In all probability, ultimate resources in this area will be twice those of the United States. The full extent of its resources is unknown. For the good of the world it is necessary to develop this Middle Eastern oil. It is in the backyard of Europe, North Africa, and India. Middle Eastern oil should be developed, we feel, primarily for the Eastern Hemisphere. Its development would lift a burden from the back of the United States and the Western Hemisphere sources which have been serving the world's energy needs for so long.

To summarize very briefly: (1) There is ample energy in the world for our logistical task; (2) The technical problems of converting solid fuels, such as coal, to liquid fuels have been solved; (3) Fuel resources are fairly well scattered throughout the world; (4) The problem is not one of resources so much as it is the development and use of these resources particularly outside the United States.

Now, let me finish my observations by discussing the most important kind of energy of all, human energy. It has been said that in war morale is to material as three is to one. In production I think spirit is to raw materials as three is to one. Human energy is the keystone of the energy arch. We cannot leave it out of our logistics.

It seems to me that the challenge to develop sufficient energy to raise the standard of living of the world substantially involves a political challenge. There are boundless sources of energy in the world today; our problem is to find and use them. We must bring about conditions which will appeal to men who must take great risks.

Let me illustrate the point by reference to the industry in which I work. Petroleum has been a powerful force in expanding the industrial production of the world largely because millions of people have seen in its development an opportunity for themselves. Oil is distinctly an American development. Most of the great advances which have been made in this field have been made under the leadership of free Americans. Most of the foremost petroleum technicians of the world today have been trained in the highly competitive American petroleum industry. Most of the oil in the world has been discovered by free Americans.

It is no accident that the United States with 15 per cent of the petroleum resources of the world has produced 70 per cent of the petroleum. (*Concluded on page 540*)

Defense, International Co-operation, and Peace

Economic Reconstruction and Political Security Would Be Enhanced by a North Atlantic Community Fostering Peace to End War

By Clarence D. Howe

Symposium Speaker

LOGISTICS in war might be expressed as a science of using all available resources at the right spot at the right time, the aim being to defeat the enemy. If this definition is adequate, the purpose of the logistics of peace would seem to be to prevent, as far as may be within our power, the outbreak of a third world war — this year, next year, or any other year. If this proves to be impossible, we must of course win the next war. A complementary purpose must be to sustain and to improve the level of life among all those honestly willing to work for a free and peaceful world.

These purposes are not original, but their lack in that respect is more than made up in their urgency and importance. Since July 16, 1945, that fateful summer day when the test atomic bomb was dropped in the desert of New Mexico, we have been confronted with the real possibility that our civilization may be totally destroyed. Man may literally be hanging on the brink of his own destruction. With regard to the complementary purpose of a higher standard of living, we can ignore only at our own peril the necessity for a more widespread distribution of material benefits resulting from the present industrial revolution in this machine day. Professor Fermi said the other day: "Science must accept its social responsibilities."

Obviously, the logistics of peace demand that our defenses be strong. Your country and mine are fully aware of this requirement, and are working together in an effort to strengthen the defenses of the North American continent. Our active collaboration on defense problems commenced in the early days of the last war. The Ogdensburg Agreement of 1940 provided for the creation of a Permanent Joint Board on Defense. That was followed by the Hyde Park Agreement of 1941, which enabled us to co-ordinate our economic resources for the efficient prosecution of the war. The Permanent Joint Board on Defense is continuing to function. The Board is composed of representatives of each country, participating on the basis of equality, with the sovereignty of each country carefully respected. The purpose of the Board is to assure the most effective defense of North America. The Board is sponsoring a number of defense projects that help to build up a co-ordinated system, regardless of the boundary line that separates our two countries. The Board also has been helpful in bringing about standardization of our defensive and offensive weapons.

Canada is both a North American country and a member of the British Commonwealth of Nations, and thus is a link between your country and Britain. It has always been our object to promote better understanding between these two freedom-loving countries, and I believe that we have been helpful and can continue to be helpful, in that direction.

Although Canada is a small country in terms of man power, it has an important war potential in its surpluses of food and strategic minerals which contributed no small part to the winning of the last war. Since the war ended, Canada has been in the midst of a period of unprecedented expansion. Our already great surpluses of copper, nickel, zinc, and lead are being enlarged by new discoveries, particularly in our northern territories. During World War II, Canada furnished about 40 per cent of all aluminum used by the Allies, and even this great production is proving insufficient to meet current demands, and is in process of being expanded. Our already considerable production of uranium is being augmented by new discoveries. Our economy has been deficient in iron ore and in petroleum. Here again, new properties are being developed, which will shortly make us an exporter of iron ore. The recently discovered pool of oil, that many believe to be the largest on this continent, promises to make us less dependent on your country in that respect.

During the last war, we were able to produce base metals to meet all the demands of war, and we are in

Post-Dispatch Pictures from Black Star

Our great water powers are being developed with all speed in an effort to keep up with the growing demands for hydroelectric power which is the lifeblood of Canadian industry.

Canadian Pacific Railway Company

The volume of commerce between Canada and the United States is far greater than that which flows between any other two nations on earth.

better position than ever to do so now. Our water powers are being developed with all speed in an effort to keep up with growing demands for hydroelectric power, which is the lifeblood of Canadian industry. Canada is sponsoring an active immigration program, designed to populate our waste spaces. We are well aware that a population of 12,000,000 people cannot hope indefinitely to hold a territory so vast and so rich in national resources as is the Canada of today. In the meantime, we are doing our best to make it possible for countries that require to import food and raw materials to obtain both in Canada.

Your European Recovery Program would certainly seem to be a master stroke in the logistics of peace. In expressing admiration for the statesmanlike move, it may be inappropriate for me to speak comparatively of the Canadian effort towards the same end. But in proof of Canadian sincerity in supporting this great concept, perhaps you will permit me to quote from testimony submitted to your Congress by Norman M. Littell, member of the District of Columbia Bar, Washington, D. C. Mr. Littell said in part:

> Almost without debate, and certainly without delay Canada, having the second strongest economy in the world, adopted its own "Marshall plan" and acted to its fullest capacity in the gigantic task of helping Europe. By the end of 1946, Canada had loaned $1,250,000,000 to the United Kingdom, another $607,300,000 to France, the Netherlands, Belgium and Norway, and had given $154,000,000 to U.N.R.R.A. — a total of $2,011,300,000. On the basis of comparative population, this would be equivalent to about $25,543,000,000 of grants and loans by the United States, or $33,000,000,000 on the basis of comparative national production in 1946.
>
> Actually the United States in the same period granted and loaned about $11,502,000,000, or proportionately less than one half of Canada's contribution.

The purpose of your Marshall Plan, as well as the purpose of Canada's postwar loans to European countries, is to re-establish world trade on a multilateral basis.

Today, there are few nations in the world able to trade with your country and pay for their purchases in goods or dollars. The same situation holds true for Canada. In spite of the World Bank and the International Monetary Fund, efforts to make currencies convertible have not succeeded. Thus many nations are being denied access to the raw materials and manufactured goods that are essential to their well-being. Your European Recovery Program is another worth-while effort to build up the economies of European countries to a point where world trade can again flow in normal channels.

The volume of trade between Canada and your country is far greater than that which flows between any other two nations on earth. Last year, trade across our common border reached a total of over three billion dollars. You sold to Canada more than you sold to Britain and France together, and you imported from Canada more than twice the value of the goods you received from any other four countries combined. Normally, Canada imports from you far more than she sells to you, and this was particularly true last year, when we bought from you goods valued at about two billion dollars, and you bought from us goods valued at about one billion dollars. Under normal conditions, this unbalance is not serious, as we are able to settle our adverse trade balance with your country with dollars earned from surplus of exports to Britain and other countries throughout the world. It was, however, a serious matter in the period when we were selling to Britain on long-term credits and paying our trade deficit to you with American dollars. By last November, we found that our American dollar reserves in your country were being depleted at a rate that must mean American dollar bankruptcy within a short period, unless the drain on our dollar reserves could be stopped. The trend could only be stopped by adopting a program designed to restrict imports from dollar countries and expand exports that would result in dollar earnings. A Canadian program to accomplish both was introduced, which involves prohibition of luxury imports, rationing of more necessary imports, excise taxes to discourage buying of luxury articles, and an import-permit system for controlling capital goods, which is designed to stimulate exports as well as to discourage imports.

By these means we have succeeded in bringing our trade into reasonable balance, but, in doing so, we have been forced to take steps that are wholly inconsistent with Canadian policy to encourage and stimulate world trade. I am glad to say that your country has understood and accepted the necessity for our action designed as a temporary measure to enable us to continue to pay for our imports in dollars, and has placed no undue difficulties in the way of carrying out our corrective program.

We will, of course, remove these artificial restrictions as soon as our reserves of American dollars can be restored to normal. The positive side for us is that, in the future, we shall be less dependent on your country for components of our manufactured goods, which have played so great a part in our industrial production. In this difficult period, we are grateful for the full measure of friendly co-operation of your government.

The present situation, as between Canada and the United States, is typical of that between your country and the countries of Europe, and in fact between your country and other countries in all parts of the world. Such barriers can be removed only by increasing production in war-devastated countries, which will in turn make possible a better balance of trade between nations. Your European Recovery Program should do much to bring about the desired expansion of international trade in both directions.

No convenient plan springs to the mind for the logistics of peace. I do wonder, however, (*Concluded on page 544*)

The Economic Means to Peace

Increased Productivity of European Industries without Restrictive Trade Barriers Holds Key to World Peace

By Richard M. Bissell, Jr.

Symposium Speaker

DEVISING economic policies that will increase the likelihood of peace and prosperity is, obviously, not an activity that can be divided according to the geographic area under consideration. Peace and prosperity must exist over most of the world or they will not exist here in the United States. Consequently, any discussion of the economic means to world-wide peace must concern economic developments in the whole trading world. On the other hand, the United States has a special concern at this moment with Western Europe, and for this reason attention will be focused on the recovery of European countries.

Because economics affects all of us, there is a temptation on the part of those practitioners of economics to assume that all are equally well informed on economic theories and know thoroughly, for example, the reasons why a country's standard of living is of such tremendous importance. I shall not run the risk of such an assumption, however, and would like to take this opportunity to preface my address by emphasizing the reasons why economics is so major a factor in the means for obtaining and maintaining a just and enduring peace throughout the world.

In a word, the economic means to peace is important because it is a necessary condition for the attainment and continuation of peace in all societies of the world I would like to amplify this general statement by breaking it into two distinctly separate remarks.

My first remark deals with the long-range problem. If we are to create conditions in the world for which war is less likely than it has been in the past, there must be created a world-wide economic balance, a general economic well-being, and its corresponding social tranquility which is so necessary for a just and endurable peace. But in addition to this long-term condition which can lead to economic reconstruction and recovery in the world at large, there is the more important, and in some cases the more difficult, problem of preventing the resumption of hostilities. This leads to my second remark which concerns the more immediate short-term problem confronting us. There has not been a really complete cessation of hostilities. At this moment, as we all know, we do not have peace, but merely a discontinuance of the active phases of war. The world is now divided into two hostile camps in a kind of armed truce. In such a state of affairs we see, and we clearly recognize, the danger of resumption of active warfare as a distinct possibility in the future. Our immediate problem, therefore, as contrasted to the long-range problem, is to alter the present uncertain and unsatisfactory state of affairs and to achieve a more wholesome and encouraging world outlook.

At the moment we are primarily concerned with the short-term aspects of a viable peace. In this connection we must recognize that the social structures throughout the world have been disintegrating in recent years, and this is especially true in Europe. The social structures have been weakened by World War II to such an extent that Europe now more nearly represents a sort of political vacuum than a continent of nations, willing and able to conduct their affairs as great, independent but co-operating powers. It is necessary, therefore, to reconstruct and recover the social structures which have been destroyed or paralyzed.

At the present time, only two great centers of power exist in the world. They divide the world power, and the responsibility for peace, between them. The existence of these two powers is the source of our present danger of war. We cannot have peace if one of these powers insists on following its own nationalistic policies of aggression and expansion against the wishes of nearly all other civilized countries, or if it vetoes and opposes well-intended co-operation of the vast majority of the nations of the world.

We cannot obtain a condition of recovery, or of filling the vacuum which now exists in Europe, by tearing down either of these two great powers. Our objective must be constructive; it must be one of reviving European countries to their position of prewar power and self-reliance so that they may once again become independent nations. If, in our present program of recovery, we are able to reconstruct once more the independent nations of Europe, that in itself will be a great contribution to international peace.

The economic means for achieving peace are, however, important in the long run as well as in the short run. Recovery and reconstruction, whether of Europe or of the whole trading world, can be planned intelligently only if we know what sort of world economy can come into being and what sort of world economy we would like to bring into being. It is logical, therefore, to begin with a consideration of those factors, resulting from the war, which have produced permanent economic changes in world affairs, and to examine, as well, the long-term effect of such upheavals.

Major changes in the world's economy have taken place during the war; other important changes are still to come about. The social and economic upheavals occasioned by the war have been massive in their effect on civilizations; they have affected most directly the relations between

(The text of this article presents the substance of the address delivered at the symposium on "Logistics of Peace" by Richard M. Bissell, Jr.)

Western Europe and the rest of the world, but to some extent they have affected all nations and all parts of the world.

As one tremendously important example of the changes wrought by the war, we may cite the fact that Western Europe is already cut off from Eastern Europe, and that trade, commerce, and communication between these vital parts of the continent are virtually at a standstill. The social and political changes resulting from the war are responsible for these conditions which greatly affect the entire economy of the Europe of today. In an economic sense, we must realize that we can no longer depend upon Eastern Europe for an exchange of trade or ideas, as we could before World War II.

But although the social and political upheavals have produced their greatest economic disruption in Europe, this is not the only part of the world which has been thus scarred. When we look at Southern Asia, for example, we are forced to conclude that, although peace ultimately will be restored, there will not be the same amount or kind of trade between Southern Asia and the rest of the world as existed prior to World War II.

All over the world prices and costs have risen sharply. Here is a rather obvious economic factor which has affected relations between nations. It has had a profound effect on the relations between Europe and the Latin American countries which, before the war, carried on an extensive interchange of agricultural and manufactured products. It affects the agrarian countries and regions of the world quite as much as it affects the highly industrialized areas. So far as regards trade with Europe, part of this new situation is of course the result of present political conditions. An even greater portion, however, is the result of economic factors alone.

Photo by Parma from Black Star

If we are to create conditions in which war is less likely than it has been in the past, we must create a general world-wide economic well-being in which all have sufficient to eat.

As one result of the war, Europe has lost sources of tremendous income. It has lost this income not alone through property damage or other direct results of the war. It has also lost greatly through the political and geographical redistributions which have taken place, such as, for example, the withdrawal of the British from India. Such geographical alterations contribute to those permanent changes in international affairs which influence world recovery and affect our program of assistance to foreign nations.

The changes which have occurred within the last decade or so have rendered the economic position of Western Europe much weaker than it was before World War II, and certainly weaker than it was before World War I. In its economic importance to the world at large, and in its trading position, Western Europe no longer retains the position it held before the war.

In any foreseeable future, Western Europe must remain an exporter of manufactured goods and an importer of food and raw materials. For several reasons, however, the maintenance of this position seems certain to be more difficult for the future than it was before the war. The food and raw material producing nations of the world will be increasingly independent of the political and economic control of Western Europe. Their industrialization continued during the war and will be accelerated. The European countries have permanently lost overseas investments from which they formerly derived substantial earnings. The terms of trade have shifted in favor of food and raw material producers and against industrial producers. All of these circumstances suggest that Europe's position will continue permanently to be more difficult and that the less developed areas of the world will seek to maintain permanently an economic status quite different from that which obtained in the past.

These actual and prospective developments define the short-run recovery problem with which the European governments and our own government are now grappling. They also define the world's economic problem and give a hint as to the means for obtaining a solution. There are four tasks which must be accomplished.

First of all, it is a mistake to call the problem of rehabilitating Europe one simply of production. Great strides have been made since the cessation of hostilities in rebuilding factories, railroads, and other major factors of production, so that, of itself, production is no longer the bottleneck, or even the principal element, in European recovery. The first task is one of ending the profound trade disorganizations which have taken place as a result of the war. Trade is disorganized within European countries, between those countries and, more generally, throughout the world. Trade is disorganized both between countries and between industry and agriculture within many countries; there is wide discrepancy between production and availability of goods in the towns and cities on one hand, and the agricultural regions on the other.

The second important problem in European recovery is one of achieving social tranquility. In a very true sense, any social tranquility which is to be useful as a basis for a permanent peace must be based on sound economic considerations. This implies the necessity of reconstructing a standard of living to conform to the changed economic conditions which now exist in Europe. It is always unpleasant to have to recognize the (*Continued on page 536*)

Education for Peace

The Primary Lesson, in Educating for Peace, Is to Consider First What We Can Do to Make Ourselves Indispensable to the Welfare of Our Fellow Men

By Arthur H. Compton

Commencement Address

THERE is before us one task which is so much more important than all else that it can properly be described as the great goal for our generation. This task is to establish a stable peace. When we say, establish peace, we do not mean merely that the guns must not be firing; we mean by peace rather, "a condition of mutual confidence, harmony of purpose and coordination of activities in which free men and women can live a satisfactory life." This condition of confidence and harmony is the only stable peace. It is stable, because when people have experienced a free life with mutual confidence and harmony, they will strive to maintain that condition.

We are no longer engaged in armed fighting. But the condition of mutual confidence is not here. The purposes of nations are not harmonious. The world's activities are poorly co-ordinated toward our chosen goals. Only a few of the earth's vast population can say that they are free people living a satisfactory life.

The atomic bomb was the dramatic announcement that the time had come when wars must cease. In December of 1942 I saw Enrico Fermi perform the experiment which released the first atomic chain reaction. Atomic power, controllable, the dream of a generation of scientists, became then a reality. I telephoned President Conant at Harvard in our extemporaneous wartime code: "The Italian navigator has just landed in the New World." Less than three years later two bombs fell on Japan. They put a sudden stop to a tragic war. But they did something else. They brought fear, too. It was clear that our moral stature must grow before we could safely play with atomic fire. "Modern man is obsolete," was the striking phrase of Norman Cousins, describing how the advances of technology had made out of date the approaches to our social and political problems that in a preatomic age had seemed good enough.

Can we learn to live together before these great new powers overwhelm us? This is the great question. It is a challenge to our power to learn, to the forces of education. If another major war comes, our present efforts to rebuild our stricken world will have been fruitless. Instead will come disaster, and the dashing of our hopes for the future. This the world must know. We must educate men and women so that they will choose freely the path to peace. We must learn to live in peace or civilization cannot survive. Education for peace is thus the first task of the atomic age.

Just what is it that we and the world must then learn? We have tried to interpret the needs of the new age in terms of control of atomic energy. Such control is important, but the reorientation required by the new conditions symbolized by atomic energy are vastly more fundamental. We need a change in heart. What is this change of heart? It is that no choice is now safe except as it is based upon the common good of man. There may have been a time when men could afford to be selfish, when one might trust that by following his own interests the good of all would result. It is now no longer possible for us to thrive unless those around us share our prosperity. As individuals our growth depends upon the possibilities of the community of which we are a part. Our nation's welfare similarly depends on the healthy life and co-operative spirit of our neighboring nations. To such an extent has this become true that the most important element in national safety is no longer a nation's ability to repel an invasion. Its basic safety against attack now demands rather making the nation's services so valuable to its neighbors that, in their own self-interests, they cannot afford to fight it.

The primary lesson in educating for peace is thus to consider first, what we can do to make ourselves necessary to the welfare of our fellows. The admonition that "the greatest among you shall be the servant of all" is no longer merely a guide to the satisfying life. In the atomic age it expresses for nations, as well as individuals, the condition for survival.

The historical setting is favorable for the establishment of a lasting peace. In the period between World Wars I and II, James Harvey Robinson, Columbia University's eminent historian, in his book, *The Human Comedy*,* traced the trends observable through history that are working toward lasting peace. He concluded that at the time of his writing (about 1933) there was a reasonable chance that no major war would again occur unless some tragic accident should happen. Such a tragic accident did happen in the form of Adolf Hitler, a megalomaniac blind to spiritual values, and backed with the might of one of the world's most powerful nations. Similar views were being expressed at the same time by that great prophet of human destiny, H. G. Wells, and somewhat more cautiously by such scholars as E. P. Cheney, who was able likewise to identify the peaceward trends through history's long ages.

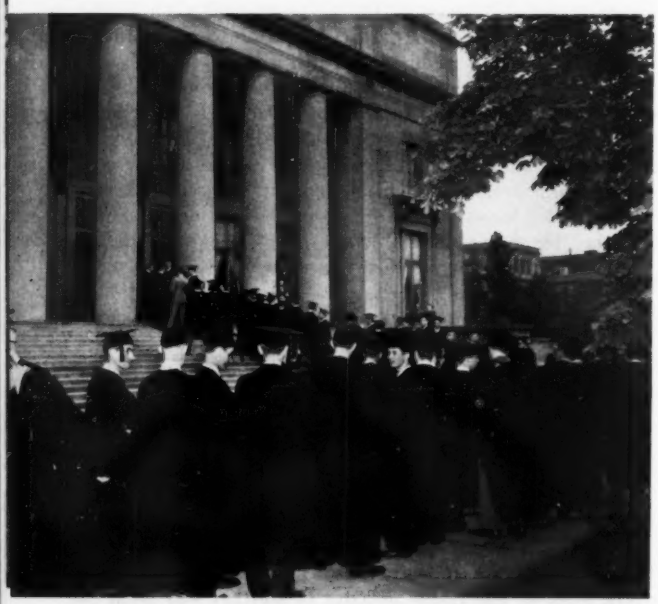
The fact that a great war followed upon these predictions does not alter the validity of the arguments. It means only that we must once again strive to put the world in order. Once more we may fail. But the powerful forces of social evolution are working fast, and as each generation passes we are substantially closer to a truly stable peace. The question before us is whether we can now hold off the tragic disaster of another war until the forces of peace will become dominant.

* New York: Harper and Brothers, 1937, $3.00.

The long-time historical trend was strikingly described by H. G. Wells, when he noted that there is one organism which, in the short space of a thousand generations, has changed from an individualistic animal, like a cat, to a social animal, like a bee or ant. He referred, of course, to man. During the past few generations this evolution has proceeded at a greatly accelerated pace. With the rise of technological industry, two noteworthy demands are being made of us. The first is that we shall serve our fellows. The second is that we must receive more education so that this service will be more effective. Associated with both demands is the requirement that we learn to identify our own welfare with that of our fellows. These demands are the outgrowth of a long-time trend associated with the advance of science. They are no sudden development. Yet with the advent of the atomic age they are rapidly becoming compelling.

Let us note how co-operation among individuals and groups becomes vital in a society based upon science and technology. Such a society is necessarily made up of specialists, not only scientists and engineers, but skilled laborers, salesmen, administrators, educators, and legislators. Working alone, a single specialist cannot sustain himself. But when all their work is co-ordinated they form a society of enormous strength.

As a typical example of the effectiveness of such co-operation of a group of specialists, let me cite the wartime project for developing the method for producing the atomic bomb. At the peak of the research task, there were roughly 10,000 laboratory workers in more than 100 locations, studying different aspects of this single problem. Not only theoretical physicists and nuclear chemists were needed: Equally essential were corrosion experts and metallurgists, and haematologists and meteorologists, laboratory technicians, mechanics and office workers. No one person could be skilled in every field or understand even the meaning of the answers to the many problems. But somehow the group mind integrated such specialized knowledge into the useful form of a process that successfully produced an atomic bomb. The same is true of our everyday tasks, where each of us, doctor, lawyer, engineer, businessman, teacher, housewife, is doing his or her highly specialized part in serving society, in return for which we receive what we require.



Cap and gown are the order of the day for graduates of the Institute shown here assembled before Walker Memorial for their baccalaureate sermon.

It is a major source of our nation's vitality that we have very diverse elements in our population, and highly diverse conditions of life in various parts of the country. Each group has its place among the many specialties. Because of their greatly varied skills, our society has immense versatility. We can cope with extensive changes in the conditions of life. When the efforts of all are co-ordinated toward a common objective, our society finds that it has gigantic strength.

The key characteristic that makes such co-operation effective is the desire of the individuals to serve, to contribute to the welfare of society. Without this spirit of helpfulness, a person cannot be fitted happily into the modern setting. With it the other essentials follow. Co-operation in doing the world's jobs, training to do one's own task well, and adaptation to living and working with others, these will follow if we are driven by the desire to help each other. It is this desire to serve, to contribute to the welfare of society, which is likewise the first essential for building peace.

Similarly we observe a rapidly increasing requirement for training and education to do the tasks needed by the modern world. The achievement of our nation in winning the recent war is typical. Victory came not only because of brave fighters in the field, but also because of the skill of millions of workers, the knowledge, ability, and experience of many technical men, and the administrative ability of our industrial and military leaders.

It is only in the modern era that formal higher education has been available or, for that matter, has been wanted by more than a small fraction of the population. For the past 80 years the college attendance has approximately doubled every two decades. Thus, my father was one of about 75 of his age group in the United States who attended college. My son, now in college, is one of about five. To compete in the modern world, more people need more training. It is not technical training only that is required, though this is vitally necessary to win our wars and to perform the essential tasks of peace. In a democratic society that is forced into world prominence, our citizens, as well as our leaders, need to understand both their own problems and the human needs of all the nations. If this democratic society is to compete successfully with dictatorial civilization, it must likewise develop leaders of outstanding professional competence, dedicated to honorable action in the interest of human welfare.

The pressure for more training and education thus applies at all levels. Automatic machinery performs an increasing number of routine jobs. The demand for skilled mechanics to make the machines is increasing, while that for unskilled labor falls off. The growing complexity of society multiplies rapidly the demand for all kinds of persons trained to keep the work co-ordinated. These range from filing clerks to administrators. There is an acute shortage of those whose over-all view is adequate to guide wisely the growth of an industry or community.

This is why more students want more extensive education. We are beginning to realize that our strength lies in the many millions of our citizens who are working

efficiently and loyally at the nation's tasks. Widespread education, encouragement of each individual to seek for the place in the game where he can play best, opportunity to gain competence and to earn recognition and a decent living — all these have helped to strengthen our society. The welfare and strength of a nation demand that all possible effort be given to enable and encourage every one of its citizens to contribute his best to the needs of his community. This means increasing education.

That the amount of education is rapidly increasing is thus evident. It is not so clear, however, that education and peace go hand in hand. One recalls that Germany, in 1930, had perhaps the highest level of education of any major nation. Yet that was where a new World War began. In Germany the trouble seems to have been primarily a failure to understand spiritual values. Culture there was of a kind — the study of the beauties of art and music, a search for joy through health and sports, a search for knowledge, especially that of a practical type. Yet there was a subordination of the individual to the state, failure to recognize that the value of the state itself is only that of the persons who compose the state, and inability to see that persons are of value to each other because all are precious in the sight of their divine Father. It was basic blindness and error on such spiritual truths as these that made German education so vastly damaging rather than helpful to the world. With clearer insight as to the value of persons, Germany would have sought to solve her very real economic problems by putting her extraordinary productive powers to use in supplying the needs of her neighboring nations and would have thus won their co-operation. Instead, Germany attempted to force her neighbors to become her unwilling servants, and thus caused catastrophic conflict.

The fact is that during the past two or three generations the United States, while retaining its willingness to fight to defend its freedom, has completely lost intersectional antagonisms of a potentially warlike type, and has developed an ardent desire to avoid war with other nations if this is consistent with our own freedom and security. During the same period, Europe, at least those of her nations controlled by small groups of "leaders," has retained its warlike character. Is this difference perhaps ascribable to the fact that in a dictator-controlled nation the people are taught that their highest duty is to the state, whereas in our democracy we are taught that government is "for the people" and that the duty of the responsible citizen is to see that his fellow citizens have the best possible opportunity for free development? In any case, it is clear that education for peace means learning that the welfare of each lies in the welfare of all, a lesson that, in an age of technological industry, seems compellingly evident.

The evolutionary law of survival of the fittest applies to societies, as well as to individuals. According to this law the society of the future will inevitably advance along the lines of co-operativeness, concern with service for the common welfare, and education to do one's tasks effectively. It is because of the sure growth of these peace-producing forces that one has confidence in the ultimate dominance of peace and elimination of war. Our task is to foster these developments so that they will become dominant before another more major war can come.

The grand strategy for establishing peace is essentially simple. First of all, by political adjustments and by military force, if necessary, we must prevent developments from occurring that will lead to a new war. Second, we must foster the growth of the forces that are working toward lasting peace. If our generation is successful in this effort, there is a high probability that war may not return for a long time, and that mankind will have the opportunity for developing the way of life that it wants.

This approach to peace can be described as a three-point program. The first task is to maintain the military defenses required that we may deter the use of armed might in solving international disputes. Second, political adjustments must be sought that will encourage the development of world society through the free flow of goods, of services and of ideas, and the travel of people. Third, the peoples of the earth must learn to know and understand one another, so that men will be encouraged to supply each other's needs and to seek each other's help rather than to master or destroy each other.

For each point of this program, education is essential. Thus, first, only by thorough understanding of our changing world can people know that it is no longer possible to gain a better life by waging a victorious war. Nations do not start wars when they expect to be defeated. War has now become so dangerous that even the victor must expect to be badly hurt, whence victory has little meaning. Policing a warlike world to prevent the outbreak of fighting is the world's job, not that of any single nation. Yet, as long as so much of this responsibility is in our hands, I am among those who believe that full military preparedness is an essential safety factor in preventing the outbreak of war. The sooner the world can be educated to assume the responsibility for policing itself, the sooner can our nation be relieved of the unwelcome role of world protector which perforce we must now play if immediate threats to freedom are to be averted.

If, in the second place, a peace-producing political pattern is to be established, the world's peoples must learn why it is that certain large areas, under the changing conditions of the modern world, have grown into peaceful social units while others have been breeding grounds for war. We have noted that the United States is a typical large area in which intersectional hostilities have become unthinkable. Under the drive of industrialization, Europe, on the other hand, has become perhaps even more warlike. Why? Is it, as we have suggested, because we concern ourselves with the welfare of persons rather than of political entities in our democratic form of government? Is it because the absence of barriers at state boundaries, good roads, and automobiles, permit widespread travel and commerce to weld our people together? Is it simply because the only armed strength is under control of the nation as a whole? Whatever the reasons, these should be studied and learned and taught, so that the world may know what it is that makes a society peaceful. On such a subject the people of all nations need reliable information, not propaganda. Ignorance or error in designing a social system is far more dangerous to mankind than ignorance or error in the assembly of an atomic bomb. In the study of the forces that lead toward peace, and of the tensions that breed war, is a problem worthy of the world's most competent scholars. Teaching the world of their findings and devising ways to build these findings into its political, economic, and cultural life are our great educational and organizational tasks.

Third, and most important, *(Continued on page 530)*

The Urge for a Better Life

Those with a Record of Having Done Creative Tasks Well and of Having Given More Than Was Expected of Them, Are the Persons for Whom the Greatest Demand Exists

By Karl T. Compton

Valedictory Address

IT is my honor to be the first to address the Class of 1948 as Alumni of M.I.T. It is even more an honor for you to bear, henceforth, the name of this great institution. You have earned your right and demonstrated your fitness to bear the M.I.T. trade-mark, and we have confidence that you will further enhance the good reputation established by your predecessors throughout the 80 years since the first graduating class, and throughout the 50 years represented by the Class of 1898 which shares with you the honors of this day. I should like to discuss, rather informally, some thoughts about education and related things which have recently been running through my mind.

A small group, representing the professional fields of theology, law, medicine, business, and engineering, met at Buck Hill Falls, Pa., to exchange ideas on the subject of professional education. In one of the sessions, a very strong case was made by a biologist for the thesis that the basic motive back of education, and in fact back of everything else in life, is the "urge to live." In other words, the struggle for survival is the first law of life. The biologist pointed out that this is true not only of people, but of every type of living organism, with or without conscious effort. When grass is cut, it keeps on growing. When a tree is injured, it develops a protective scar tissue and heals over. So does a cut finger or a broken leg. Nature is prolific in its scattering of seeds, spores, and sperms in order that the various species shall survive. And almost incredible are the struggles for survival by people lost in the woods, shipwrecked or imprisoned, or, by animals which are victims of danger or disaster.

Truly the urge to live is basic; it is a feature of biological behavior of cells and tissues, of the instinctive reactions of all animals, and of the conscious planning and effort of human beings. But though mankind shares with all other forms of life the urge to live, there is another urge which seems to be peculiar to man and to distinguish him from all other animals or other living things. It is the urge to live better.

Consider how true this is. The habits of plants or fish or insects or animals do not change, except for occasional minor adaptations to changing climate or environment. Ants have continued to build their ant houses, and birds their nests without change, species by species, for as long as we can trace the records. It is man alone, of all living things, who has consciously and to a staggering degree changed his ways of living. He has changed his food, clothing, and shelter; he has changed his methods of transportation and communication; he has changed his ethical and social codes of conduct; he has changed his organization for group living. Man has employed imagination and logic, he has invented, he has developed new skills, he has created new concepts of values, he has manipulated the materials and forces of nature for his purposes. Basic to all these things is man's urge to live better, supported by his capacity to analyze and to evaluate and through imagination to project his evaluated ideas into the reality of the future.

The record of achievement of the better life is found in the relics of the Stone Age, the Bronze Age, the Age of Steel or of Power, and the beginnings of perhaps the Atomic Age. The record is found in our books of history, philosophy, and science, in our laws and government, in our Bible and all the religious codes and concepts. So, without further belaboring the point, I simply restate my thesis that the distinguishing characteristic of man is his urge and capacity to live better. Let me comment on four aspects of this urge to live better: the urge for an education; the urge for a job; the urge to create; the urge to serve.

You came to this institution undoubtedly because you and your parents believed that the education gained here would enable you to live better. The advantage to be gained from education is viewed differently by different people. For example, it may be the "thing to do" in the group to which you belong. This is not a very high motive, but it is quite as legitimate as it is old. Benjamin Franklin wrote of the students whom he observed in one of the great old colleges, who had no particular talent or ambition, but who attended the college because it was "done" in their social circle. He said of them that he was concerned over the future of the young men who went forth from this "famous place, for they were unable to work, ashamed to beg, and to live by their wits was impossible." No, this motive is not of the highest, but this can be said for it: it can lead to an education and it can lead to exposure to great personalities, great ideas, great opportunities and to the firing of high ambitions.

Some people go to college because they hope this will raise them to what is often regarded as a higher position in society By going to a trade school, an unskilled lad fits himself to become a skilled technician or a foreman; a farm boy goes to college and postgraduate school and may become a doctor or a teacher. Several years ago it was a fact that more of the scientists whose names had been added to that year's edition of *American Men of Science* had been born in Iowa than in any other state. The reason was that Iowa is a well-to-do agricultural state. The farmers could afford to send their children to college. To them a white-collar profession, like science or medicine or teaching, was a natural and understandable step up the ladder of their urge for a better life. Among

the city-born boys of the East, on the other hand, raised in a hectic environment of buying and selling, the urge was relatively stronger to go into business to make money, and a larger proportion did this.

A third motive for going to college is this desire to make more money. This again is a legitimate and very common motive. The dollar-sign path is generally well marked, at least statistically, for frequent studies are published which show the average earnings, one or five or twenty years out of college for the doctor, lawyer, engineer, teacher or what have you. Often such studies also show the average financial advantage of taking a master's degree or a doctor's degree.

A striking example of this motive occurred in the 1920's, when fortunes were being made on paper at a great rate by buying and selling of stocks. Most people did not stop to realize that true wealth comes from production of desirable goods, and not from progressively raising the price tags. During this era, students in our colleges flocked into the departments of economics because of their notion that some knowledge of economics would insure quick wealth. This rush into economics created a major problem in college administration, but the problem vanished when the bubble burst with the depression. Now many students study economics, or business administration, or engineering, or law because they see in these professions an increased ability to earn a good living.

A fourth reason for going to college is enthusiasm for a particular career or line of work. Sometimes this is definite even from the start, like young John who has the dream of building airplanes, or Jim who has wanted to be a chemist ever since his father got him that chemistry set for Christmas. But more often the young man or woman discovers his talent and enthusiasm while he is in college, with opportunity to see and explore new activities.

Such was the case with Charles A. Stone and Edwin S. Webster who graduated from M.I.T. in 1888. They were intrigued by that new branch of applied physics which was just coming to be known as electrical engineering. As a senior thesis they made a joint study of a new type of alternating-current transformer. They became enthusiastic over the idea of establishing themselves as a firm of consulting electrical engineers, and sought the advice of their distinguished professor regarding their idea. He approved the idea, but advised against their both going into the business for, he said: "There may be enough electrical business in the United States to keep one consulting engineer busy, but certainly not enough for two!" But they had faith and enthusiasm, and went ahead; their business grew and prospered; they became pioneers in public utility construction, operation, and financing. The firm of Stone and Webster is an example of the power of education fired by the spark of enthusiasm, when operating on a high quality of natural ability.

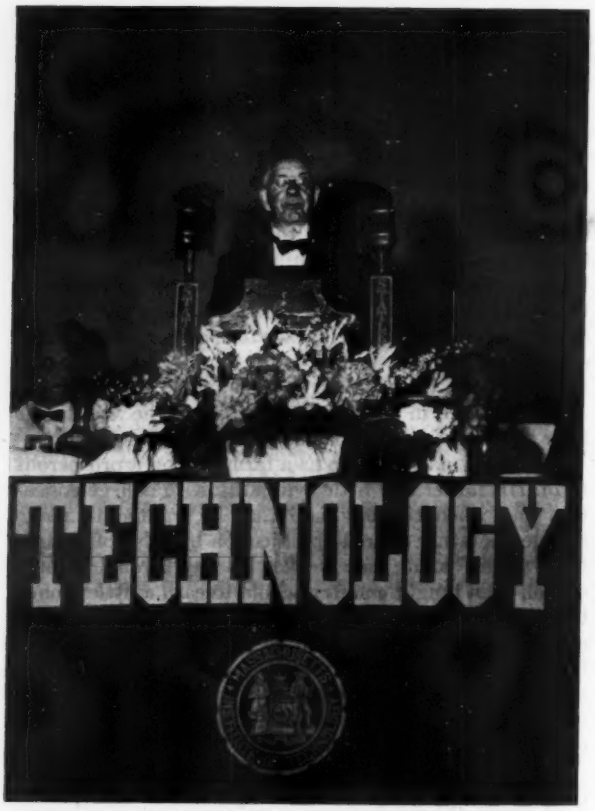
Some of you have had to make great sacrifices to satisfy the urge for education which is receiving recognition in these exercises today. That you have succeeded is all the more reason for satisfaction and confidence, and I often think of the many cases in which the overcoming of great obstacles has seemed to be an essential part in the building of a very successful career. There is something about overcoming obstacles which strengthens character and purpose. I think of two men who have greatly influenced my life and whose careers were remarkably similar. One of them came as an immigrant from the Isle of Man in his early teens and went to the great new territory of Minnesota just then opening up. He secured a job as a druggist's clerk and studied by himself in spare time. When he heard of the opening of the new University of Minnesota and the fact that tuition was free he walked some 30 miles and landed in Minneapolis with less than $4.00 in his pocket and applied for admission to this new institution. He passed the entrance examinations and subsisted by securing a job of tending the furnace and milking the cow of a citizen living in the suburbs. He slept on a cot near the furnace for warmth and used the furnace to cook his meals, which consisted of baked beans, with tomatoes for variety, and milk from the cow. He became a great scholar and a great influence in the community, where he was in his later years revered as a patriarch and a philosopher.

The other man grew up as a farm boy on a prosperous farm. His father had little sympathy with college education and when the boy said that he wanted to go to college his father offered no objection but also offered no help, so this young man worked his way through normal school, then taught country school to earn a little money to go to college, and in college he practiced the same economy as my other friend by subsisting on a diet of baked beans, with tomatoes and milk for balance. He graduated *summa cum laude* and went on for graduate work and became professor, dean, and acting president of the institution from which he had graduated.

The characteristics of both of these men were an indomitable urge for an education, pursuit of their profession because of its intellectual satisfaction, and their continual attitude toward their work as a service to the institution with which they were connected and especially to the young men and women who were their students, and not as a career for personal gain or glory. The result was that many thousands of young people look back with gratitude and reverence to these two men who did so much in the molding of their careers.

Consider, now, another aspect of the urge to live better and one which is probably vividly in the minds of many of you at the present time. I refer to the urge for a job, or perhaps I should say the urge for a better job. Offers of jobs are coming in to the students graduating this year, to some of them in large numbers and to others in not such large numbers. Many students, on their side, are applying for jobs. All are wondering about their careers and how they will turn out. What about a job? Perhaps one can paraphrase the famous statement: "Some are born great, some achieve greatness, and some have greatness thrust upon them." We can paraphrase that with reference to people and jobs: some are born with jobs (through their fathers), some earn their jobs or apply for them, and some have jobs thrust upon them.

Over and above your qualifications as a candidate or applicant for a job, there is always a considerable element of luck. Just to give you some comfort or feeling of confidence in case you happen now or later to be discouraged over the prospects for a job, let me refer very briefly to my own experience in this respect. Shortly before I had secured my Ph.D. degree at Princeton I began looking around for a job for the following year. No offers had come my way and so I got the names and addresses of presidents, or deans, or physics department heads in 40 American colleges or (*Continued on page 546*)



Edward S. Chapin, '98, Secretary of the 50-year Class, presents his class gift at the Alumni Day Banquet.

ALUMNI DAY - 1948

HOPE and confidence for the future — of Technology, of the nation, and of the world — loomed large in the minds of those taking part in Alumni Day, with its manifold associated festivities, this June. It was appropriate, therefore, that this spirit of guarded optimism be the underlying note of the many addresses and events, beginning with the baccalaureate sermon on Thursday, June 10, and ending with the final partings after the annual banquet on Saturday evening, June 12. It was reflected by President Compton's banquet address in which plans for a greater Technology were announced for the first time, and it was brought into sharp focus by the Alumni Day symposium, appropriately entitled "Logistics of Peace," emphasizing the need for taking aggressive, constructive action in the waging of peace.

Thoughtful and stimulating consideration of the many demands which are imposed by the complex, interdependent life, which is one product of science and technology, was enunciated in the addresses about which ceremonies centered. In chronological order, Everett M. Baker, Dean of Students, stressed the need for winning freedom through the assumption of responsibility and called for a return to religion in his baccalaureate sermon; Arthur H. Compton, Chancellor of Washington University, called for service to one's fellow men in the commencement address to graduates; another brother of the outstanding Compton family emphasized the need for creative tasks ably performed by graduates in the valedictory address which President Karl T. Compton delivered to the Class of 1948; Robert T. Haslam, '11, of Standard Oil Company of New Jersey, and first of three symposium speakers, took a buoyant view of the world's energy resources; Clarence D. Howe, '07, Canadian Minister of Trade and Commerce, foresaw continental peace and security through co-operation between Canada and the United States; Professor Richard M. Bissell, Jr., recently transferred to the European Recovery Program, outlined the economic basis for a viable peace in Europe; and finally, in his banquet address, President Compton announced plans for expanding the facilities and operations of M.I.T. It is The Review's pleasure to be able to print, elsewhere in this issue, the full text or comprehensive summaries of these addresses.

At the President's Dinner for Honorary Secretaries at the Brae Burn Country Club on Friday, June 11, representatives from five foreign countries, as well as 50 secretaries from various parts of the United States, were present, in addition to 21 officers of local alumni clubs and about a dozen members of the M.I.T. staff. In good spirit these men went to work to discuss the important problems of liaison between the Institute and freshmen planning to enter M.I.T. each year, and to listen to informal and stimulating talks by Professor B. Alden Thresher, '20, Director of Admissions, and James R. Killian, Jr., '26, Vice-president of M.I.T. At the evening dinner, President Compton and Paul M. Chalmers, Adviser to Foreign Students, were honored for their work on behalf of foreign students studying at the Institute. Acting on behalf of King Haakon VII of Norway, Bjarne Ursin, Norwegian Consul in Boston, bestowed the title of knight commander of the Order of St. Olaf upon Dr. Compton, and made Professor Chalmers a knight in the same Order.

While wives and guests held their own dinner, and later attended the Boston Pops concert at Symphony Hall, approximately 1,000 Alumni attended the Stein-on-the-Table Banquet, and filled to overflowing Boston's largest ballroom in the Hotel Statler. Because of lack of space, the Alumni Association reluctantly was forced to forego its practice of earlier years of inviting members of the graduating class to attend the banquet as its guests. However, at the Senior Banquet at the Hotel Continental in Cambridge on June 9, members of the graduating class received from the Alumni Association the 1948 commencement steins, designed by Henry B. Kane, '24.

Prominent among those taking part in Class Day activities were (left to right): John T. Toohy, '49, President of the Junior Class, to whom the class ring was transferred; William R. Zimmerman, '48, Permanent Secretary-Treasurer of the graduating class; J. David Cist, '48, Permanent President of the graduating class; William L. Stewart, Jr., '23, 25-year speaker; George K. Parmelee, '48, President of the Senior Class; and William B. Maley, '48, chairman of Senior Week.

As President Compton made his annual report to Alumni at the banquet, those who had labored long and arduously to make Alumni Day, 1948, an outstanding event in M.I.T. history, could relax and breathe a sigh of satisfaction for a task well done.

. . . *Baccalaureate Service* . . .

An unexpected note of sadness was injected into the baccalaureate service held in Walker Memorial on Thursday morning, June 10. Joshua Loth Liebman, Rabbi of Temple Israel in Boston, had been selected to address the graduates on the topic "Facing the Future: Hope and Challenge." A recent illness, coupled with overwork, took its toll, however, for Rabbi Liebman was stricken with a fatal heart attack on June 9.

In delivering the baccalaureate address, Everett M. Baker, Dean of Students, expressed deep loss in the sudden, tragic death of Rabbi Liebman in the following words: "When he graciously accepted the invitation of your class officers to speak to you at this occasion of your baccalaureate service, we all rejoiced that we would have this opportunity to meet and hear so distinguished a citizen of our nation, so friendly a neighbor, so wise a counselor, so prophetic a preacher, and so popular an author."

Instead of speaking on the theme selected by Rabbi Liebman, Dean Baker stressed the fact that freedom must be won at the price of responsibility, and reminded his audience that responsibility must be assumed as well as given. Another major point in the address was that whatever one calls it, religion is the highest and best that each of us knows; it is the "anchor chain which holds us fast to our ideals, when tides of disappointment would sweep us out upon a fog-covered ocean of despair."

. . . *Class Day Exercises* . . .

As chairman of Senior Week, William B. Maley, '48, opened the activities of Class Day with an address of welcome, and then called upon William L. Stewart, Jr., '23, who, as 25-year speaker, had words of encouragement for the graduating class.

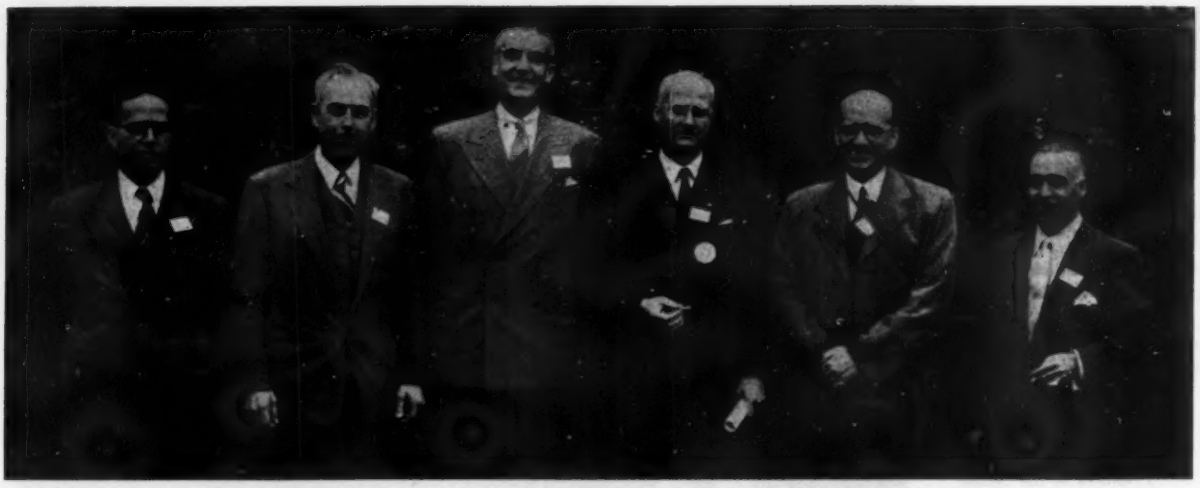
Next, Professor Charles-Edward A. Winslow, '98, made his address for the 50-year Class, emphasizing differences between the hopes, aspirations, and general outlook of the present graduating class and that, half a century ago, when Dr. Winslow left the Institute. In part, Dr. Winslow said:

> The history of living things — and here biology has something to offer us — teaches something more inspiring than what we are often inclined to take with us from the teachings of the physical sciences. The physical sciences teach us that the world is gradually running down; that we are ultimately headed for a universe in which all is lifeless and static. But the biologist has a more inspiring story to relate. Biology teaches us that cells grow and become more and more complex; that from the lowly single-cell creatures, such as the amoeba, life, and living things become more highly developed and specialized, more complex. The urge for the more highly specialized and complex finally culminates in human beings as the present pinnacle of life on this world. There is something extraordinarily encouraging and interesting in these facts of biology. Whatever happens, there is something worth while going on in the constant struggle and development of more interacting and interlocking agencies.

. . . *Stratton Prize Oration* . . .

As Stratton prize winner, Werner H. Gumpertz, '48, made an exceedingly able oral presentation of a paper on "Thrust Problems in Damaged Arch Bridges." His paper dealt with certain engineering problems which he had encountered in Germany during World War II, and outlined emergency repair measures which had been put into operation by American occupation troops to aid in the reconstruction of Germany.

In traditional ceremony, representing the transfer of administration of student government from the graduating class to the new senior class, George K. Parmelee, Senior Class President, transferred the Beaver Class Ring to John T. Toohy, President of the Class of 1949.



Five foreign countries were represented when President Compton gave a dinner for the M.I.T. Honorary Secretaries who work with the Admissions Office and serve as ambassadors of information and good will in acquainting incoming freshmen with the Institute. Photographed during the outdoor luncheon in Du Pont Court (in usual reading order) are: Antonio H. Rodriguez, '21, of Havana; Paul M. Chalmers, Adviser to Foreign Students, and awarded the cross of the Order of St. Olaf in recognition of his work on behalf of the Institute's foreign students; David A. Shepard, '26, of London; Harold R. Bjerke, '23, of Oslo; William F. Rivers, '26, of Calcutta; and Arturo Marques, '27, of Montevideo.

J. David Cist, Permanent President, made the presentation of the gift from the Class of 1948. He announced that the graduating class had decided that its gift should take the form of an athletic trophy, to be awarded annually to the outstanding M.I.T. athlete of the year. The trophy is to remain the permanent property of the Institute, where it is to be displayed, but each year the winner will receive a replica of the trophy awarded to him. In gratefully accepting this gift, President Compton expressed his belief that the trophy was a wise, and certainly a most welcome, gift.

. . . *Westgate Skit* . . .

As has been the custom for many years, the graduating class staged an entertaining skit as its application for admission to the M.I.T. Alumni Association. With the help and guidance of Professor William C. Greene of the Department of English and History, the skit was written and planned by Stanley J. Adelstein, '48. William E. Katz, '48, wrote the music, and Philip R. Macht, '48, wrote the lyrics. The skit depicted life at Westgate and emphasized the difficulties which were encountered by married veterans in conducting their studies at the Institute while simultaneously carrying out the responsibilities of normal family life.

Upon conclusion of the skit, Raymond H. Blanchard, '17, President of the Alumni Association, presented the M.I.T.-1948 banner to Mr. Parmelee in token of acceptance of the graduating class into the Alumni Association. Mr. Blanchard also presented the Class with a copy of the recently printed *Alumni Register* and a copy of the model class constitution prepared for use by

The registration desk, in the lobby of Building 10 under the large dome, was turned into a beehive of activity on the morning of June 12 as more than 1,000 Alumni registered for the events of Alumni Day. Some 1,100 attended the outdoor luncheon under canvas in Du Pont Court, approximately 650 attended the afternoon symposium, and 1,000 were in attendance at the evening Stein-on-the-Table Banquet at Boston's Hotel Statler.

The afternoon symposium "Logistics of Peace" was one of the most attractive features of Alumni Day. Photographed (left to right) in Walker Memorial just prior to the addresses are: William W. Garth, Jr., '36, chairman of Alumni Day; Professor Richard M. Bissell, Jr., Staff, on leave as assistant director of the European Recovery Program, who spoke on "The Economic Means to Peace"; Robert T. Haslam, '11, Vice-president, Standard Oil Company of New Jersey, whose topic was "World Energy and World Peace"; Clarence D. Howe, '07, Canadian Minister of Trade and Commerce, who gave the address on "Defense, International Co-operation, and Peace"; Professor Norman J. Padelford, symposium chairman, and President Karl T. Compton.

those classes which wish to adopt it. He commented also that with the graduation of the Class of 1948 the Alumni of M.I.T. had increased from approximately 40,000 to more than 41,000 persons.

. . . *Commencement Exercises* . . .

Graduation exercises were held in Boston's Symphony Hall on the morning of Friday, June 11, and were notable for at least three reasons. First of all was the fact that two of the well-known Compton brothers took part in the ceremonies: Karl Taylor Compton gave the valedictory address, and his Nobel Prize-winning brother, Arthur Holly Compton, gave the commencement address, both of which appear in this issue of The Review. A second notable feature was the fact that with 905 candidates receiving 910 degrees, this was the largest class yet to be graduated from the Institute. Among those receiving degrees were 65 candidates for the doctorate, 233 for master's, and 607 for bachelor's degrees. Listed among the graduates were 14 women students.

In his presentation of degrees, President Compton had an unusual word of commendation for Jules S. Levin, '48, who, during his four years at the Institute, managed to achieve a perfect record of *H's* in all subjects which he studied.

. . . *Aerial Shower* . . .

In conjunction with its reunion luncheon, the Class of 1898 staged the first Aerial Shower in history on Friday, June 11. At 1:15 P.M., as graduates were returning from commencement exercises, a seaplane landed in the Charles River Basin and taxied to the M.I.T. Sailing Pavilion

The first Aerial Shower in history took place on June 11 when the seaplane of Luis deFlorez, '11, landed in the Charles River Basin, tied up at the M.I.T. Sailing Pavilion, and Lester D. Gardner, '98, presented Mrs. Compton with gifts from the world's air lines in recognition of the part which M.I.T. has played in the development of world aviation. At the Sailing Pavilion (left to right) are: Luis deFlorez, '11; Lester D. Gardner, '98; Mrs. Compton, and President Compton.

Luncheon of the Class of 1898 followed the Aerial Shower on June 11. At the head table (in reading order) are: Mrs. Arthur H. Compton; Major General Frank A. Keating, Commanding Officer, First Service Command; Lester D. Gardner, '98; Mrs. Lester D. Gardner, and President Compton. Gifts presented to Mrs. Karl T. Compton are exhibited on the table in the foreground.

where a group of 50-year graduates were awaiting the pilot, Luis deFlorez, '11, and his passenger, Lester D. Gardner, '98. Upon landing, Mr. Gardner presented to Mrs. Compton numerous gifts from air lines in all parts of the world, in recognition of the Institute's active role in the development of world-wide aviation.

Although not officially a part of alumni activities, the annual dinner for the Institute's Honorary Secretaries was held on the afternoon and evening of June 11, as already recorded.

. . . *Alumni Day, 1948* . . .

Although the weather was cloudy and overcast, continuing Boston's previous six weeks' trend, the activities of Alumni Day were in no way dampened, either figuratively or literally. Under the able direction of William W. Garth, Jr., '36, Alumni Day Chairman, and his active committee chairmen (Edmund B. Fritz, '32, *Banquet;* John A. Hrones, '34, *Class Day;* Herbert L. Beckwith, '26, *Exhibits;* Mrs. B. Alden Thresher, *Ladies' Program;* John B. Wilbur, '26, *Luncheon;* Ralph T. Jope, '28, *Publicity;* Wolcott A. Hokanson, Staff, *Registration;* Donald Whiston, '32, *Symposium Arrangements;* Malcolm S. Stevens, '34, *Transportation;* and Delbert L. Rhind, Staff, *Ways and Means*) all activities ran along smoothly and promptly to make the day's events pleasant for all Alumni and guests.

At 11:00 A.M. on Alumni Day the Institute's new athletic cage was dedicated and named in honor of Dr. John A. Rockwell, '96, who was actively associated with M.I.T. athletics for half a century. Taking part in the dedication ceremonies were: Dr. Rockwell, President Compton, and Ivan J. Geiger, Director of Athletics.

Beginning at 8:30 A.M. the registration desk in Building 10 was open for those who had registered to pick up their tickets, to permit others to register, and to serve as general headquarters for information. The lobby in Building 7, on Massachusetts Avenue, was devoted to an instructive exhibit on world trade, travel, and communication, in keeping with the theme of the symposium "Logistics of Peace."

. . . *Rockwell Cage Dedicated* . . .

At 11:00 A.M., a new athletic cage, recently erected on the athletic field adjacent to the Briggs Field House, and west of Massachusetts Avenue was dedicated. The new cage, which will serve as an indoor athletic field for M.I.T. students, was named the Rockwell Cage in honor of Dr. John A. Rockwell, '96, who has been closely associated with athletic activities at the Institute for 50 years. The dedication address was made by President Compton, with response by Dr. Rockwell.

. . . *Luncheon in Du Pont Court* . . .

By 12:30 queues had formed for the luncheon in Du Pont Court. Caterers ably and quickly served potato salad, chicken à la king, salmon salad, vegetable salad, cookies, ice cream, and coffee to approximately 1,100 persons who were protected from inclement weather by large canvas tents erected for the purpose.

The Class of 1923 had reserved tables seating approximately 200 to accommodate the sizable group who returned for their 25th reunion. Table service for the Class of 1898 and the symposium speakers was provided in Building 1.

After the luncheon, Alumni and guests gathered around in groups to discuss their present plans or reminisce about

The Class of 1923, celebrating their graduation from M.I.T. a quarter century ago, had the largest representation at the Alumni Banquet. At one of the tables (counter-clockwise order, from opening in front) were: Stephen B. Metcalf, Myron K. Chandler, Howard F. Russell, Horatio L. Bond, John E. Burchard, John H. Zimmerman, William B. Greenough, Jr., and John J. Murphy.

their student days while the sun attempted, with but little success, to dispel the overcast sky.

. . . *Symposium* . . .

By 2:30 P.M., approximately 650 Alumni and guests had gathered at Walker Memorial for the symposium on "Logistics of Peace," a title selected by Mr. Garth. Professor Norman J. Padelford was symposium chairman and skillfully introduced the speakers: Robert T. Haslam, '11; Clarence D. Howe, '07; and Professor Richard M. Bissell, Jr. More detailed coverage on this symposium will be found in the published papers in this issue.

. . . *President's Reception* . . .

Following the symposium, President and Mrs. Compton were hosts at an Open House at the President's House between 4:00 and 5:00 P.M.

. . . *Alumni Banquet* . . .

As they had done many years in the past, Alumni broke up their informal gatherings in time to be at the Hotel Statler in Boston by 7:00 P.M. for the ever popular Stein-on-the-Table Banquet. In the Technology tradition, steins bearing a new design by Henry B. Kane, '24, were available for all to take home as souvenirs of a memorable occasion. Raymond H. Blanchard, '17, President of the Alumni Association, was toastmaster.

For the 25-year Class, Robert P. Shaw presented the gift of the Class of 1923; a gift of about $70,000 for capital funds. Edward S. Chapin, '98, made the presentation for the Class of 1898; an additional fund of about $70,000 for capital funds. President Compton accepted both gifts with appreciation.

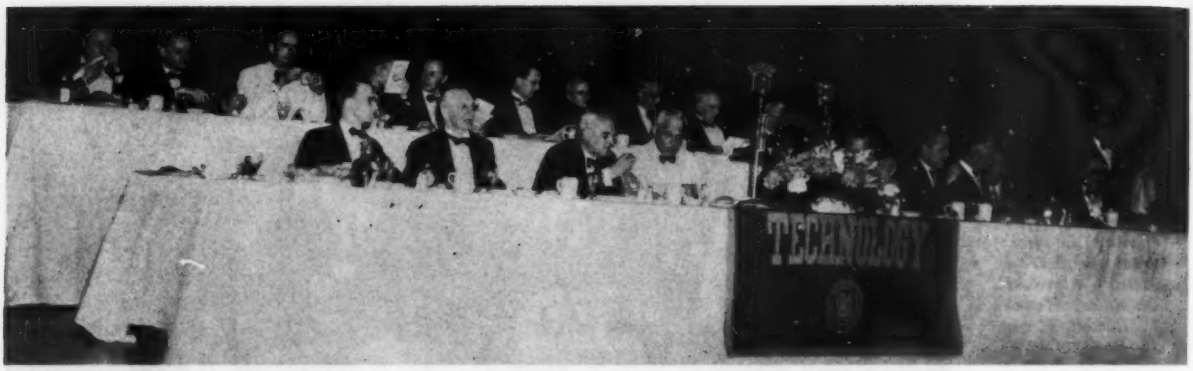
A somewhat unusual, and for this reason all the more welcome, gift was made by the Class of 1918. Favoring a gift which would emphasize the cultural aspects of living, and which at the same time would bring permanent enjoyment to successive classes, the Class of 1918 presented a Baldwin electronic organ to the Institute. Dedicated on May 16 in Walker Memorial (where it will usually be used in Morss Hall) the new organ is portable and can be moved to any part of the Institute. The most distant contribution for this cultural addition to the Institute's facilities (in the design of which Edward M. Jones, 2–44, and Raymond P. Mork, '43, contributed) came from Zeng-Tse Wong, '18, of Shanghai.

C. George Dandrow, '22, President-elect of the Alumni Association, was called upon to introduce a well-received innovation. He presented to the audience a Columbia recording of a group of medleys of M.I.T. songs made by the Dodd Singers. In the medley were included such favorites as: "Take Me Back to Tech," "A Stein Song," "Dear Old M.I.T.," and "Sons of M.I.T." Upon conclusion of the playing of this outstanding recording, Mr. Dandrow presented the original to President Compton.

. . . *Honorary Membership in the Alumni Association* . . .

President Blanchard then called upon Charles E Locke, '96, Secretary of the Alumni Association, to conduct Thomas P. Pitré, Dean of Freshmen, to the stage where, at the hands of Mr. Blanchard, Dean Pitré was given a

The playing of a medley of M.I.T. songs, recorded under the direction of C. George Dandrow, '22, President-elect of the Alumni Association, injected an additional note of conviviality during the Alumni Banquet. The original record, gold-plated and framed, was presented to President Compton by Mr. Dandrow.



Technology's Stein-on-the-Table Banquet has grown to such proportions that two head tables are now required to seat all who take responsibility for managing the affairs of Alumni Day. At the fore table (left to right) are: Professor Norman J. Padelford, symposium chairman; Edward S. Chapin, '98, Secretary, 50-year Class; Clarence D. Howe, '07, symposium speaker; President Karl T. Compton; Robert P. Shaw, '23, President, 25-year Class (to right of table centerpiece); William L. Stewart, Jr., '23, 25-year Class Day speaker; and H. E. Lobdell, '17, Executive Vice-president of the Alumni Association. At the rear table (left to right) are: Edmund B. Fritz, '32, Chairman, Banquet Committee; William W. Garth, Jr., '36, chairman, Alumni Day; J. David Cist, '48, President, graduating class; Dale F. Morgan, '38, Secretary, Class of 1938; George Henning, Jr., '33, Secretary, Class of 1933; F. Alexander Magoun, '18, President, Class of 1918; William A. Ready, '13, President, Class of 1913; Frederic A. Eustis, '03, Secretary, Class of 1903; Harry M. Latham, '93, President, Class of 1893; and Sanford E. Thompson, '88, Assistant Secretary, Class of 1888.

certificate attesting to his election and induction into the M.I.T. Alumni Association, as one of its 20 honorary members.

. . . *"Logistics of Operation Technology"* . . .

As final event of the evening, President Compton acquainted the audience with recent events at the Institute, as has been his custom since the alumni banquets have been held. His address this year was entitled "Logistics of Operation Technology" in keeping with the theme selected for the symposium. The Review is happy to present the text of the major portion of Dr. Compton's address:

The ideal climax to this afternoon's notable symposium on "Logistics of Peace" would have been the address at tonight's banquet which had been planned by your committee on arrangements to be given by the man who, more than any other, organized the logistics of our victorious war. Later, as the Secretary of State, he conceived that masterly plan for European recovery which has turned the tide of world-wide despair and confusion into an upsurge of faith, hope, and charity among those nations which must stand together against anarchy, communism, and disintegration.

We sincerely regret that Secretary Marshall, after keeping this engagement open for several months, found that his duties of prior importance forced his declination; and that our own Lewis W. Douglas, '17, who had tentatively agreed to act as Secretary Marshall's substitute, also found that his responsibilities as Ambassador to Great Britain were too active just at this time to permit of his presence with us tonight.

Never have I pinch-hit for such distinguished speakers as Secretary Marshall or Ambassador Douglas, and your regret that this has to be so is only exceeded by my own. But I have two compensations: I can take this opportunity to express publicly our great appreciation of the fine contributions to this afternoon's program which were made by our colleagues, Professor Richard M. Bissell, Jr., Robert T. Haslam, '11, and the Honorable Clarence D. Howe, '07; and I can turn the discussion of "Logistics of Peace" into that channel which is our own greatest responsibility, namely, the role of the Massachusetts Institute of Technology. *(Continued on page 518)*

Thomas P. Pitré, Dean of Freshmen, was conducted to the speaker's platform by Charles E Locke, '96, to receive from President Raymond H. Blanchard, '17, his certificate of election as an honorary member of the M.I.T. Alumni Association. Others at the head tables may be identified from the caption and illustration above.

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Dean of Humanities

APPOINTMENT of Professor John E. Burchard, '23, as dean of humanities at M.I.T. has been announced by President Karl T. Compton. Professor Burchard, Director of Libraries and also of the Albert Farwell Bemis Foundation, succeeds Dr. Robert G. Caldwell, Dean of Humanities since 1939, who retired on July 1.

The Division of Humanities is co-ordinate with the Schools of Science, Engineering, and Architecture, and includes the Departments of English and History, Economics and Social Science, Business and Engineering Administration, Modern Languages, and the administration of the Institute libraries. The Division is also responsible for instruction in such fields as sociology, labor relations, government, international relations, law, philosophy, psychology, literature, and music and the fine arts, for both undergraduate and graduate students, and is charged with the administration of the four-year program in the humanities required of all undergraduates.

Under Dr. Caldwell's administration the program of the Division of Humanities has been expanded and enriched by the introduction of new opportunities for the wider cultural development of all students. Dr. Caldwell was formerly United States Minister to Portugal and later Minister to Bolivia. In addition to his diplomatic service, Dr. Caldwell had wide teaching experience in history, political science, and economics in universities of the United States and India before coming to the Institute in 1939.

A graduate of the College of Wooster, to which he later returned as a professor of political science, he carried on advanced studies at Princeton University which granted him the degree of doctor of philosophy in 1912. In 1914 he started a 19-year career as professor of history at Rice Institute in Texas where he was appointed dean in 1918. During the summers from 1929 to 1932 he was visiting professor in the graduate school of Columbia University, and held a similar post at the University of Chicago in 1930.

As a historian, Dr. Caldwell is the author of: *A Short History of the American People; James A. Garfield — Party Chieftain;* and *The Lopez Expedition to Cuba.* He is also the author of several other works on history, economics, and politics. During World War II, Dr. Caldwell served on the general advisory committee on cultural relations of the Department of State and the Office of Inter-American Affairs.

Professor Burchard was born in Marshall, Minn., in 1898. After three years in the College of Liberal Arts of the University of Minnesota, his education was interrupted by service with the United States Army Medical Corps in the American Expeditionary Forces. Upon his discharge in 1919, he entered M.I.T. from which he was graduated with the degree of bachelor of science in architectural engineering in 1923 and received the degree of master of science in 1925.

John E. Burchard, '23

. . . succeeds Robert G. Caldwell as dean of humanities

In 1925, Professor Burchard joined the staff of Bemis Industries, Inc., and during a period of 13 years became vice-president of that corporation and of its subsidiary, The Housing Company. In 1938, he returned to M.I.T. as director of the Albert Farwell Bemis Foundation, with the rank of full professor.

From 1940 to 1945, Professor Burchard was on leave of absence from the Institute while engaged on important war work. He served progressively as executive officer of a committee of the National Research Council, as chief of one of the 18 divisions of the National Defense Research Committee, and as deputy chief of the Office of Field Service. He was chairman of the Joint Army-Navy Office of Scientific Research and Development Committee on Scientific Information Policy and of the O.S.R.D. Publications Committee.

Professor Burchard returned from war work in 1945 to take up duties as director of libraries of the Institute, a post to which he was appointed in 1944. During his term of office, plans were consummated for the construction of the new Charles Hayden Memorial Library now being built. He served as a member of the Coöperative Committee on Library Building Plans which, under a Rockefeller Foundation grant, has prepared a monograph on planning university library buildings.

He has written extensively for domestic and foreign periodicals on housing, library planning, architecture, and educational and cultural subjects. He has just completed a history of M.I.T. in World War II.

4-H with New Meaning

FOR the first time in the Institute's history a Technology student has gone through a four-year course of instruction with a perfect mark of *H's*. This unusual record was established by Jules S. Levin, '48, of Miami Beach, Fla., who will conduct research in atomic energy at the Brookhaven National Laboratory now that his undergraduate days are over.

Four years — and nothing but *H's*!

C. Frank Allen: 1851–1948

OLDEST professor emeritus on the M.I.T. Faculty, C. Frank Allen, '72, who was for many years a member of the staff of the Department of Civil and Sanitary Engineering, died at his home in West Roxbury on June 6, in his 97th year. Professor Allen is survived by his wife, and by two daughters, Professor Mildred Allen of Mt. Holyoke College, and Miss Margaret Allen.

Professor Allen was one of the most distinguished members of the Faculty of the Institute, and during its early years he was influential in introducing many advances in educational methods in the Department of Civil and Sanitary Engineering of which he was administrative officer from 1909 until 1911.

After attending Roxbury Latin School, Professor Allen was graduated from the Institute in 1872, and joined the Faculty as assistant professor of railroad engineering in 1887. He became associate professor in 1889 and held the rank of professor of railroad engineering from 1896 until his retirement in 1916. Professor Allen was awarded the honorary degree of doctor of engineering by Northeastern University in 1938.

Before joining the Faculty of the Institute, Professor Allen had wide experience in engineering practice. He spent 10 years in various engineering projects on the Atchison, Topeka, and Santa Fé Railway in Kansas, Colorado, and New Mexico, and for a time was associated with the Mexican Central Railway. He was also engaged in private practice during this period as a consultant on engineering projects in Providence, Newton, and Boston, and was, for a time, chief engineer of the Las Vegas water works. During this period he studied and practiced law, in addition to his engineering work, and in 1885 was admitted to the bar in New Mexico and later to the bar in Massachusetts.

Early in his career he was a director of the Massachusetts Highway Association and later became secretary of the Society for the Promotion of Engineering Education (now the American Society for Engineering Education). He was a member of the New England Railroad Club, the American Society of Civil Engineers, and of other engineering and scientific organizations. He was known as one of the most distinguished members of the Boston Society of Civil Engineers, of which he became a member in 1875. He was a senior past president of the society, having served as a vice-president and for many years as director.

During his later years he devoted a great deal of time to studies of engineering education and was the author of numerous articles on the subject. He was also the author of *Business Law for Engineers* which was written after his retirement from M.I.T. in 1916. Until recently he had been active in the affairs of the Alumni Association of M.I.T., in which he was interested throughout his long connection with the Institute, and last year celebrated his 75th anniversary as an M.I.T. alumnus.

C. Frank Allen, '72
. . . with his daughter, Mildred Allen, '22, at the luncheon of the 50-year Class on Alumni Day, 1947.

Reporter's Night

AS is customary, reports for the year's operation constituted the main business of the 263d meeting of the Alumni Council — the last meeting of the current year — held in the Campus Room of the Graduate House on May 24. Raymond H. Blanchard, '17, President of the Alumni Association, opened the meeting by calling for the playing of phonograph records of a medley of M.I.T. songs. With this tuneful introduction, the Council got down to its work of receiving annual reports from officers, committees, and councils.

With 2,551 Alumni voting, the election of new officers of the Alumni Association was reported as given on page 446 of the June issue of The Review. The new officers-elect — Messrs. Dandrow, Denison, Ferguson, and Latham — were introduced by President Blanchard.

As a result of attending more than 50 formal meetings of 41 M.I.T. alumni clubs in the United States, Mexico, and Cuba during the past 18 months, H. E. Lobdell, '17, Executive Vice-president, was able to report unusual activity and interest in alumni clubs which were, without exception, ably managed.

The Nominating Committee for Departmental Visiting Committees submitted a slate of recommendations for men to serve on visiting committees, which was adopted by the Council. The 25-Year Class Committee has in preparation a brochure intended to provide information regarding class reunions, class books, and other information of value to class organizations. The names of those Alumni who lost their lives in the armed services during World War II are being checked in preparation for the presentation to the Institute of a memorial tablet to be sponsored by the Class of 1921.

Upon the acceptance of reports, Ivan J. Geiger, Director of Athletics, was introduced by President Blanchard,

and gave a stimulating address on "Athletics in Education." He traced the development of college athletics from its inception as gymnastic exercises, through the formation of contesting teams during the Nineteenth Century and into the present era which is, unfortunately, too often characterized by professionalism. Although it is difficult for M.I.T. athletes to compete favorably with other colleges in which undue emphasis is devoted to the building up of winning teams, the philosophy of regarding an athletic program as a logical part of the general development of the individual is regarded as eminently sound. M.I.T. teams are doing well in competition with other colleges, but the number of students taking part in varsity, intramural, or individual sports is believed to be a more significant measure of the success of the athletic program. It is estimated that as many as 600 students have taken part in intramural activities on week ends during the school year. At M.I.T., the athletic program aims to provide opportunities for every student to learn the principles of team play and to take active part in several sports for his own development. As if indicating alumni wholehearted approval of the Institute's policy on student athletics, Mr. Geiger's presentation was received with unstinting applause.

Olympics Bound

IN fitting honor to the association which has pioneered in fostering dinghy sailing as a collegiate sport since it was started at M.I.T. in 1936, Ralph L. Evans, Jr., '48, will carry the colors of the M.I.T. Nautical Association into the Olympic Games in England this summer. Mr. Evans gained this honor after first defeating representatives of 16 Eastern Massachusetts yacht clubs, and then by taking the measure of six opponents in the United States finals at Larchmont, N. Y.

Mr. Evans has been a prominent member of the Sailing Team since he entered the Institute in 1942. That year he became Freshman Intercollegiate Dinghy Champion and in 1943 won the McMillan trophy for the M.I.T. Nautical Association. His sailing and schooling were interrupted by the war when he entered the Navy and trained as a pilot. He served as an ensign aboard the carrier *Solomon Islands* operating in the Caribbean and along the Atlantic Coast during the latter months of the war. Returning to M.I.T. in 1946, he became commodore of the M.I.T. Nautical Association and captain of the Sailing Team during its successful 1947–1948 season.

The Olympic sailing races will be held at Torquay, Devonshire, England, beginning August 3 and will consist of seven races. Representatives from most of the European nations will take part in the dinghy event which is the most popular and competitive of the sailing events. Only one man from each nation is selected to compete. Most Europeans will be familiar with the Olympic dinghy, the *Firefly*, since it is a popular craft in Europe, but it is almost unknown in this country. Fortunately, M.I.T. has one of the few *Fireflies* which are now in the United States, and Evans will have her for practice sailings in preparation for his trip abroad. Evans is fast mastering the peculiarities of the craft and hopes to be thoroughly familiar with the boat by the time he sails for England.

McCarthy and Bowie Retire

HENRY P. McCARTHY, Director of Physical Training at M.I.T. for 26 years, and Robert Bowie, Field Coach, who came to the Institute in 1930, will retire this summer.

Henry P. McCarthy joined the staff of M.I.T. in 1922 and a year later was appointed director of physical training. His basketball teams have become famous throughout New England and he was the founder of the Tech Tournament, which in 1942 became the Eastern Massachusetts Interscholastic Basketball Tournament. Mr. McCarthy continued to direct the tournament which was held at Tufts College in 1942 and 1943, and was moved to the Boston Garden the following year. He has also served as director of the New England Interscholastic Basketball Tournament, and is a member of the Eastern Massachusetts Basketball Officials' Association.

Mr. McCarthy's first basketball experience was with the Utica Professional League. Later he played with Company G of the Massachusetts State Guard and on the town team of Stoughton. He has coached at Massachusetts high schools, including Arlington, Winthrop, and Revere. Early in his career he went to Salt Lake

In an unusual climax to the successful conclusion of his course at M.I.T., Ralph L. Evans, Jr., '48, will be the sole representative of the United States in the Olympic sailing races to be held this August in Devonshire, England.

City where he was supervisor of physical education in the city schools. He then accepted a post as physical instructor at the Froekel High School at Gary, Ind. Following service in World War I, he was appointed assistant physical instructor at M.I.T. and the next year became director of physical training and basketball coach.

Robert Bowie competed as an amateur early in his career and later as a professional runner. He began his coaching career at Colgate University in 1910, later going to Syracuse University. He joined the coaching staff of M.I.T. in 1930. In his 18 years as a field coach at the Institute, he has produced such outstanding athletes as James R. Thomson, '37, high-jump champion of the Intercollegiate Association of Amateur Athletes of America; Stanley T. Johnson, '36, who held the indoor broad jump championship of the I.C.4-A.; John A. Robertson, '32, New England Intercollegiate javelin champion; and Richard R. Wareham, 2-44, who is the best hammer thrower ever to compete for M.I.T.

Mr. Bowie was the guest of honor at a testimonial dinner given at the Institute on May 26.

W. Spencer Hutchinson: 1870–1948

PROFESSOR Emeritus W. Spencer Hutchinson, '92, formerly Head of the Department of Mining Engineering and Metallurgy, died at his home in Dorchester on May 25, in his 78th year.

Professor Hutchinson was internationally known as a mining engineer and as an educator in his field, and during a professional practice of more than 40 years he became widely known in mining regions throughout the world. He retired from the Institute in 1939 after serving on the Faculty for 17 years.

Professor Hutchinson was educated at Dorchester High School and at Technology, from which he was graduated in 1892 with the degree of bachelor of science. During the following year he served as assistant to Harry W. Tyler, '84, Secretary of the Institute, and in 1893 became curator of Technology's exhibit at the Chicago World's Fair.

As a miner with the Utica Company at Angels Camp, Calif., in 1894, Professor Hutchinson obtained his first practical experience in the mining and milling of gold. In 1897 he became superintendent of the American Development and Mining Company at Gibbonsville, Idaho, and from 1900 to 1903 was employed in several Missouri zinc mines, first as superintendent and later as manager. From 1903 to 1922 Professor Hutchinson practiced independently, with headquarters in Boston. During this period his work took him to various continents and into new professional fields.

W. Spencer Hutchinson, '92

Appointed professor of mining at Technology in 1922, Professor Hutchinson in the same year became a member of the firm of Hutchinson and Livermore. Five years later he was appointed head of the Institute's Department of Mining and Metallurgy. In 1937, when the Department was divided to become the Department of Metallurgy and the Department of Mining Engineering, he continued as head of the latter, until his retirement.

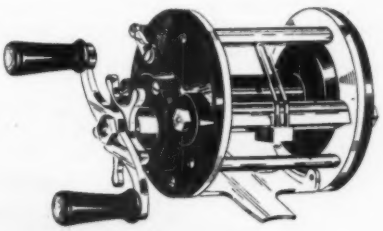
Oscar and Associates

President Compton spoke before the M.I.T. Club of Chicago on April 22, as reported in the June issue of The Review, when this photograph was made of the speaker's table. From left to right are: Mrs. Frank R. Meyer, 3d.; John W. Barriger, 3d., '21; Mrs. James M. Barker; Louis H. G. Bouscaren, '04; Mrs. Pierre F. Lavedan; President Karl T. Compton; Mrs. Robert E. Wilson; Pierre F. Lavedan, '20, Mrs. Karl T. Compton; James M. Barker, '07; Mrs. Louis H. G. Bouscaren; Frank R. Meyer, 3d., '42, and Mrs. John W. Barriger, 3d.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

Sport is fun. It is also big business, because we Americans spend many millions each year on equipment, ranging from the two-for-a-penny hooks bought by small fry to the $50,000 (and up) boats used for cruising and fishing; from bats and balls and gloves to guns, outboard motors, private airplanes. Thus sport reaches deep into American industry, to such an extent that companies you would not normally think of in such a connection are indirect suppliers to sportsmen. This is especially true of the metal industries. Revere Metals, such as copper, brass, bronze, nickel silver, are used in marine engines, marine hardware, cartridges, fishing reels, and so on, all without the user realizing it. You might ask why he should, and be quite right. All he wants is really good sporting equipment.



For example, fishermen who own salt water reels of a famous and popular make, selling for as much as $100, look to the reel to help them make their catches, while the reelmaker looks to Revere as a source of supply of fine metals, metals that are uniform in quality and can be machined with the accuracy required for reliable operation in service. Corrosion resistance under salt water conditions is also essential. Recently Revere looked over its order books and discovered that during the past three years this reel manufacturer had bought the following: Brass Strip, 11 different specifications, for use in making 12 parts; Brass Rod, 14 different items, for 13 parts; Phosphor Bronze Strip, 6 different items, for one part; Brass Tube, one item, for one part. Revere is not the only source from which this maker buys materials, which makes this list all the more impressive and satisfying. These items were specified with great care, in their various gauges, tempers and alloys, to achieve manufacturing economy as well as accuracy, and to protect the reputation of the reel, which is high, due to the use of quality materials and employment of high skill in manufacture.

In most cases, of course, the Revere Metals have utilitarian end uses. When we find them going into fine sports equipment we have an added satisfaction, heightened by the fact that the manufacturers are as meticulous in purchasing as are any other group of customers. After all, we also like to hunt and fish, and go in for the other sports too. This is true not only of Revere, but of all suppliers to industry. They too enjoy sports in leisure hours, when not busy making their good materials and helping customers select and fabricate them properly into fine products. So, it is Revere's suggestion that no matter what it is you make—fishing reels or furniture, bait boxes or bedding, it will pay you handsomely to give your suppliers an opportunity to turn their brains to your profit by permitting them to collaborate with you on your problems.

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ALUMNI DAY, 1948

(*Continued from page 512*)

. . . *Meaning of Logistics* . . .

The term "logistics" is peculiarly apt as a basis for describing the functions and operations of our institution. It has to do with the provision and disposition of men and their equipment for an operation. The operation assigned to us by our charter is "the advancement of science and its practical applications in the arts, agriculture, manufactures, and commerce." To accomplish these purposes, our charter furthermore directs us to maintain "a society of arts, a museum of arts and a school of industrial science."

In the spirit of this afternoon's symposium, therefore, can we not think of our Alumni and student bodies as our share of the man-power requirements for the logistics of peace (or for the logistics of war if our national security should unhappily again require us to think in such terms), and can we not think of our Alumni and students as constituting a great and powerful "society of arts" under the provisions of our charter?

In addition to man power, logistics calls for supplies of all kinds needed for the operation. What are these supplies, appropriate for "Operation Technology," for which M.I.T. is responsible? They are scientific knowledge, engineering art in design and production, facilities of research and instrumentation, and the arts of organization and management for using these facilities effectively. Here again our institution has made notable and often pioneering contributions, far too numerous to be mentioned here and too well known to make mention necessary. It is sufficient to say that all these things go hand in hand with our educational activities and are, in fact, inseparable from them. This is one great element of strength of our institution: all of our objectives are closely related and interwoven. This gives us a homogeneity and opportunity for team play which is notably absent in some educational institutions of widely diverse scope. It is an asset which we should cherish and exploit.

But there is one very significant implication in the word "logistics" which I have thus far not mentioned. It is this: logistics are of significance only with reference to a future operation. So let me tell you something about our logistic problems and plans as we try to project "Operation Technology" into the foreseeable future.

First, what is this operation? Basically it is the continuation of what we have been and are now doing: teaching and research in science, engineering, and architecture; supplementary education in the field of the humanities, together with research in aspects of human relations which have particular relationship to the activities of technologists; co-operation with industry and government in these fields.

A few Departments which were previously very important in our program, like Mining and Public Health, have been discontinued because changed conditions indicated that our resources could be more usefully concentrated in other directions. All programs have been scrutinized and modified in an effort to insure maximum value and effectiveness. The most intensive effort in at least 20 years in this direction has been in progress during the past two years, under a very able Faculty committee which will render its final report with recommendations next fall.

The technical developments during World War II have placed greatly increased emphasis on certain aspects of our work, notably in electronics, nuclear science and engineering, supersonic aeronautics, gas turbine engines and jet propulsion, instrumentation and high-speed devices for computation. There are good reasons for new emphasis on organic chemistry, geophysics, biophysics and biochemistry, metallurgy, acoustics, hydraulics, industrial management and industrial relations,

(*Continued on page 520*)

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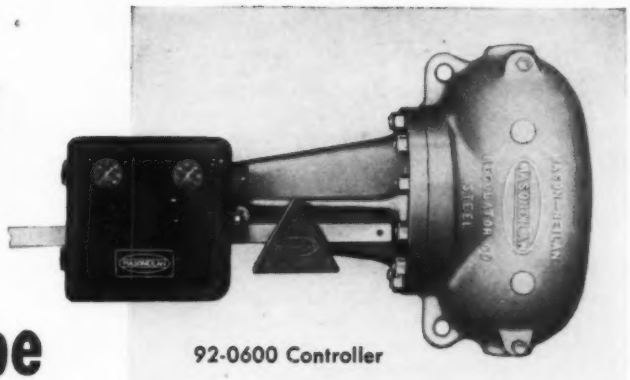

92-0600 Controller

Instrument-Type Ball Float Level Controllers

Interior View of Instrument

The ball float level controller still has a place in process control. Although level measurement by displacement has overshadowed the ball float type of measurement, there are many applications where, because of the nature of the liquid and/or operating conditions and/or physical limitations, measurement of level by ball float is the only practical solution.

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These are the same mechanisms used on our 12000 Series displacement type level controllers.

Simple, foolproof adjustment of proportional band setting over a wide calibrated range. Easy control point setting by vernier knob with indicating scale.

All assemblies are weatherproof, compact, and rugged.

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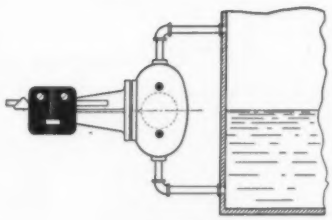
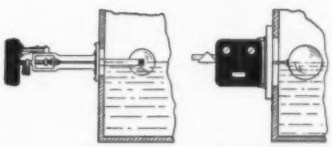


Chamber Type



Shaft Type Flange Type

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ALUMNI DAY, 1948

(*Continued from page 518*)

and the economic effects of technological progress, — and other of our activities could well be added to this list. On almost every hand the increasing complexity of modern life demands more effective specialized training combined with a more broadly intelligent outlook. It is such demands, and the opportunities that go with them, that set the requirements in planning "Operation Technology" for the future.

. . . *Institute Expansion* . . .

Our student enrollment was stabilized at 3,000 before World War II — about 2,200 undergraduates and about 800 graduate students. With the increased facilities provided during and since the war, we now envisage a total enrollment of about 4,400 — about 3,200 undergraduates and 1,200 postgraduates — as the ideal number which can be handled without such crowding as to detract from the high quality of educational opportunity for our students. During the present year, because of commitments to returning veterans, we have been definitely overcrowded with our enrollments of 5,630 in the first term and 5,200 in the second term. Next year we should get down to a better figure of about 4,800.

Three factors compel us to expand our operations beyond their prewar scope. First of these is the rapid development of science, technology, and the demands of industry. This expanding development has proceeded for many years, but the war accelerated it in several directions while at the same time building up a great backlog of requirements and opportunities. The great technical advance in particular fields calls for more intensive and extensive specialization, and this means that we must enlarge and improve our operations at the postgraduate level. Study and research at the master's, doctor's and even post-doctor's levels are inevitably in greater and greater demand. Simultaneously, the increasing complexity and interrelations of all types of professional activity emphasize the increasing importance of a well-integrated education in the fundamentals of science and culture, of basic professional requirements, and an understanding of human relations. This is primarily the challenge to our undergraduate program, of which our Faculty is now completing a very intensive two-year study.

. . . *Unprecedented Demand* . . .

The second factor is largely a result of the war. This gave such a striking demonstration of the importance of applied science to our national security and our industrial development that there is an unprecedented demand by both government and industry for the creation of a great reservoir of scientific knowledge, of engineering art, and of trained man power from which our industries and armed forces can draw to meet their future requirements. Because of M.I.T.'s outstanding performance during the war, so well portrayed by John E. Burchard, '23, Dean of Humanities, in his book, just off the press and entitled *Q.E.D.: M.I.T. in World War II*, we have been under very great pressure to accept research contracts through our Division of Industrial Coöperation. We have felt justified in taking on only a fraction of the work requested of us, and have adopted criteria that these jobs must be of important scientific or engineering interest to our staff, that they must contribute to our educational objectives, and that the results must be free for publication for the benefit of all, except under a few very special circumstances dictated by national security. This type of work is being held down to about $12,000,000 a year for operating expenses and is, of course, on a no profit-no loss basis. This work is of great value to our program for education at the higher levels, for advancement of knowledge and its practical applications, and for our service to the nation, but it does make great demands on our plant facilities.

The third factor is our reputation, in which we can take just pride. Evidence of this is the large surplus of student applica-

(*Continued on page 522*)

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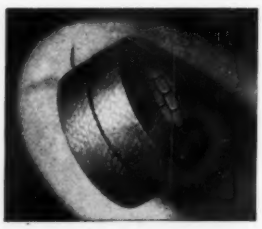

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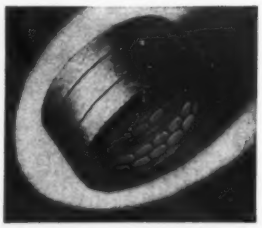

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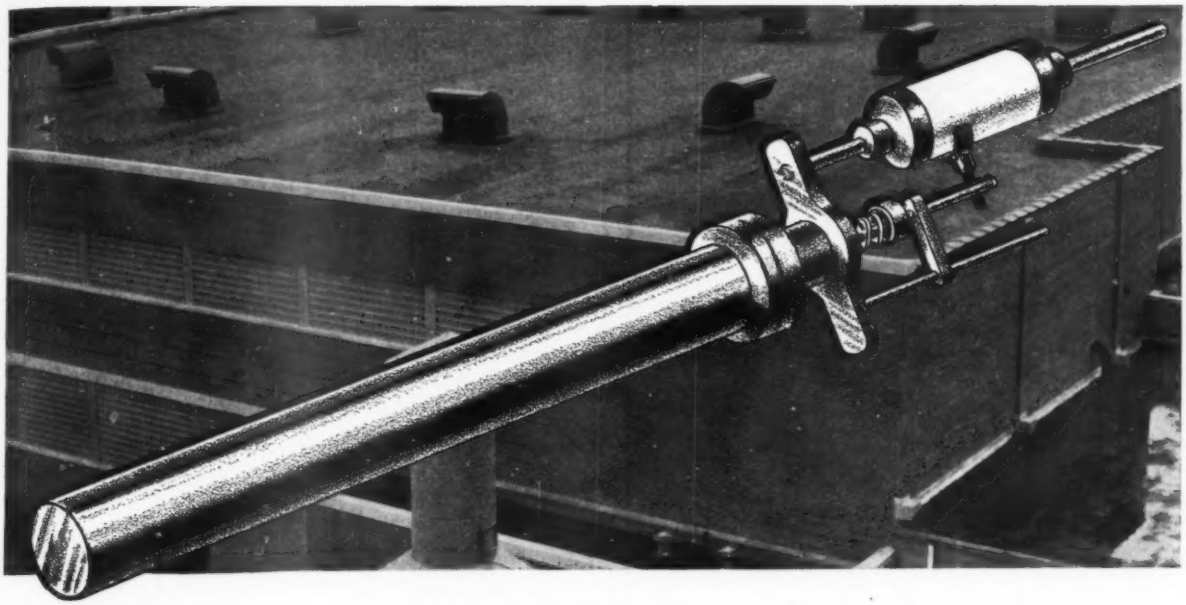


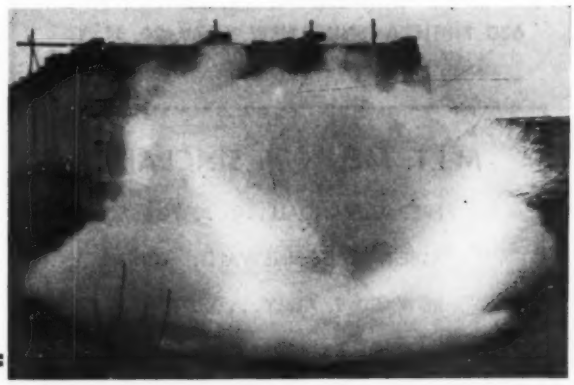
HOW MUCH OF AN EXPLOSION CAN A WALL TAKE?

—and the Little Gage That Has the Answer

VERY simple, very useful, this new gage already has reduced the costs and increased the accuracy of explosion research. Designed by Factory Mutual engineers for use at their Testing Laboratories at Norwood, Massachusetts, the gage can be adjusted to simulate the strength and natural vibration period of any type of construction. Thus adjusted, it accurately records resistance of such construction to an explosion in a heavy concrete test chamber.

This record shows directly whether or not the explosion would have destroyed the construction being studied. On the basis of this information, Factory Mutual engineers can specify any necessary improvements in construction and venting arrangement.

The explosion effect gage is one of the recent developments for the better safeguarding of Industry against the explosion hazard. And explosion research is only a part — but an important part — of the broader efforts by the Factory Mutuals in making plants safer from fire, explosion, and other forces of destruction.



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ROBERT A. WIEGAND... '45

ALUMNI DAY, 1948

(*Continued from page 520*)

tions for admission, the volume of requests for us to take on research projects of the highest importance, the desire of employers to engage our graduates far beyond our capacity to meet, and continual comments from all quarters, like the following, by one of the ablest and best informed scientists of the country, himself not an M.I.T. man, and referring to our research program: "I had a wonderful two days at Technology and I was not only impressed but overwhelmed by what I saw. It is really rolling along like an avalanche. My strong impression was that the sum total of M.I.T. activities is equal to, if not greater than, the combined activities of all universities on the eastern seaboard, and the pressure of enthusiasm even greater." This reputation is very gratifying, but it is just one more factor which emphasizes the fact that we must continue, in the words of Edward Everett Hale, "to look up and not down, to look forward and not back, to look out and not in, and to lend a hand." Our position was not reached without sustained efforts and without taking risks — sometimes large ones. The efforts must be continued and the position consolidated.

. . . *Basic Problems* . . .

So much for "Operation Technology": now let us take a look at the logistics of the situation. The logistic problem is basically one of finances, since dollars can be translated into the required facilities of staff, buildings, equipment, and operations. This problem can be stated in broad general terms in the following ways.

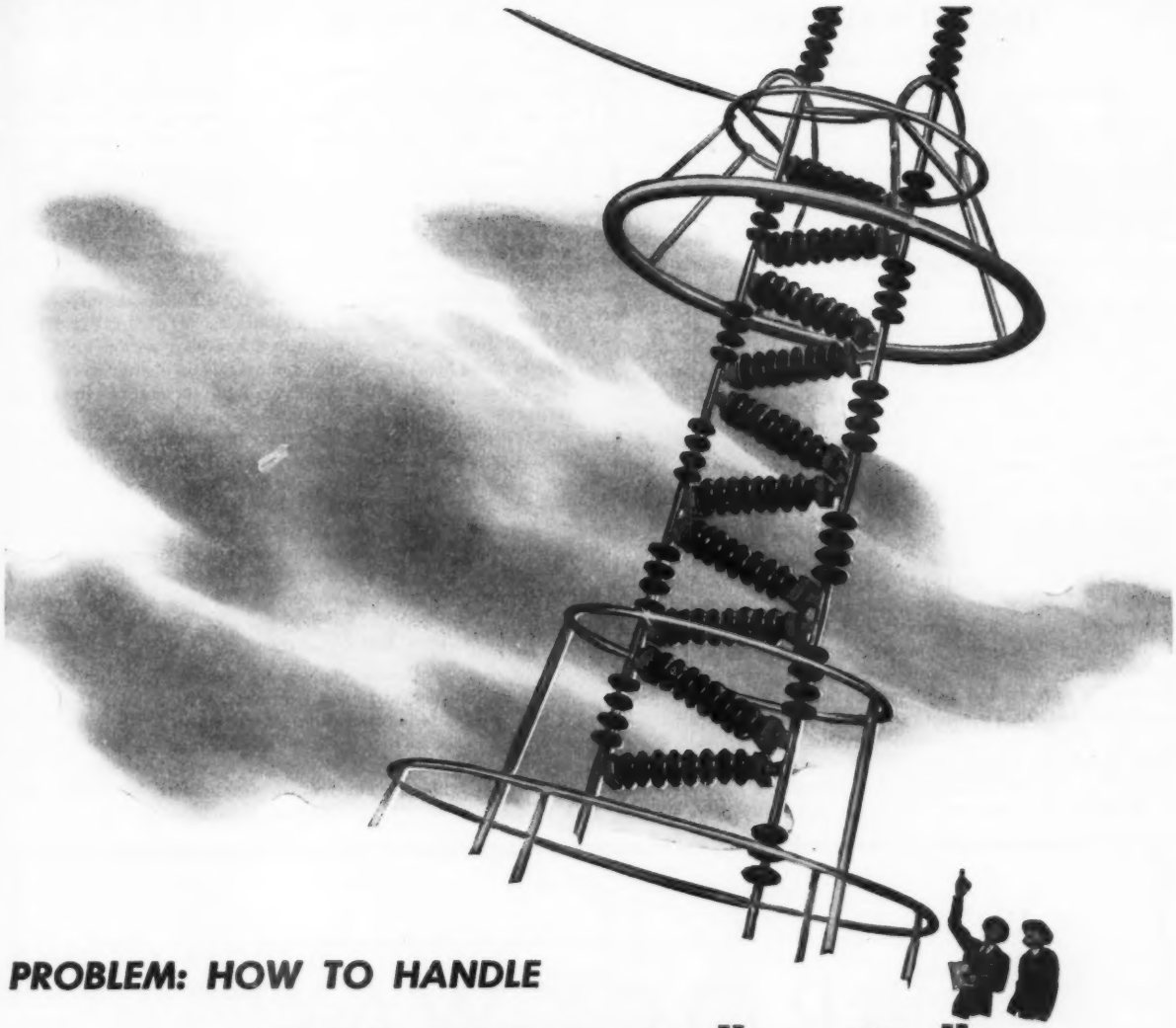
The cost of living as measured by the Consumers' Price Index has risen, as of April of this year, nearly 70 per cent since 1939. Actually in American colleges increasing compensation of faculty members has fallen far behind the rising cost of living. At M.I.T. our average monthly academic staff salary rate has gone up about 30 per cent. By means of the annual salary plan instituted at the end of the war, and involving summer-term duties, the total assured take-home pay of our Faculty has increased about 50 per cent. It should be pointed out that many of our staff on the nine-month plan earned extra compensation during the summer, both at the Institute and outside, and that while the annual plan benefited the Faculty as a whole it may not in individual cases have increased the total compensation. Also in this period the tuition has been raised by 16⅔ per cent.

From another angle, the picture may be described thus. While our endowment funds have remained substantially unchanged since 1940, our academic budget (not including the research work paid for by government and industry) has doubled, partly because of increased enrollment and partly because of generally increased unit costs. In fact, while our endowment funds have increased from $33,000,000 to $48,000,000 since 1930, the income which we receive from our endowment has actually decreased as a result of lower interest rates. The significance of these facts is realized when it is pointed out that it is income from endowment which permits an institution to rise above the hand-to-mouth level of the struggling unendowed private institution and to maintain standards of excellence and leadership alike among private and tax-supported educational institutions. In this foundation for permanent strength our situation is relatively weaker than it was.

From still another angle we can view our logistic requirements. We urgently need certain new additions to our plant if we are to play the influential role in the future which M.I.T. has played in the past. This is simply because new technological and educational developments require new facilities adapted to the new uses, and also because any increase in our student body calls for some commensurate increase in facilities.

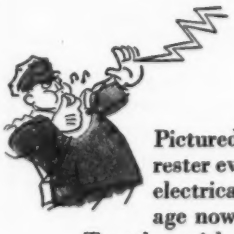
These are the main features of M.I.T.'s logistic problem. Let me conclude by telling you what has recently been done and what is going to be done about it.

(*Continued on page 524*)



PROBLEM: HOW TO HANDLE

500,000-Volt "traffic"



Pictured above is the largest lightning arrester ever built. Its job—to help protect electrical "traffic" of almost *twice* the voltage now carried by existing power lines.

Together with giant transformers, each as high as a 3-story house, this highly specialized equipment was designed and built by Westinghouse for the world's first 500,000-volt test transmission line. Now in operation in southern Ohio, this 1½-mile line will help power companies answer a vital question . . . *Can electric power be transmitted more efficiently over long distances at ultra-high voltages?* The answer may well revolutionize the economics of power transmission.

By working in the closest co-operation with power company technicians, Westinghouse engineers were able to make important contributions to this pioneering project. This same kind of co-operative engineering is available to *your* industry . . . through highly specialized Westinghouse Industry Engineers familiar with your problems.

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ALUMNI DAY, 1948

(*Continued from page 522*)

. . . *Exploring a New Era* . . .

For more than two years our Staff, Administration, and Executive Committee have studied requirements and plans for meeting them. Exploratory efforts at fund raising have met with some success and have given valuable experience for the planning of future efforts. A preliminary statement of objectives and of progress in meeting them was mailed to all Alumni and other friends about a year ago in the form of a brochure entitled *M.I.T. — A New Era*. Some of these objectives are now achieved, some progress has been made toward others, and the rest are still listed among "things hoped for."

Completed last fall were the Gas Turbine Laboratory and enlarged Sloan Automotive Laboratory. Under construction are the Charles Hayden Memorial Library, the Senior House, the Supersonic Wind Tunnel, and the athletic cage which was dedicated this morning. To be started this summer is a special new High Voltage Laboratory. These facilities are costing about $9,000,000, and the present construction represents a greater dollar outlay than even the great central educational building. The funds for them are gifts from the Charles Hayden Foundation, the Alumni Fund, a group of five industrial companies, Alfred P. Sloan, Jr., '95, the Boston Stein Club, and some war surplus, together with a Navy contract and an investment of endowment funds in the Senior House. These sources contribute a little over $8,000,000 toward the required sum, and the balance of a little under $1,000,000 is underwritten from the Institute's unrestricted funds which have hitherto been used as endowment. This is practically all of our unrestricted funds, but the Executive Committee felt that the importance of going ahead promptly with these projects was so great as to justify the risk of depleting our unrestricted funds even to so dangerously low a level. I hope that this calculated risk will turn out as favorably as several others taken in recent years.

Some progress has been made in raising funds for three urgently needed laboratories. We are almost in sight of the goal in the case of the Hydrodynamics Laboratory and Naval Towing Tank, thanks to contributions of money or equipment from a number of companies and two individuals. Less, though encouraging, progress has been made toward the Metals Processing Laboratory, though for it we have acquired a very fine and complete lot of equipment and tools from war surplus and several metal-processing companies. No progress has been made toward securing funds directly for a Laboratory of Nuclear Science and Engineering, but indirectly our efforts have resulted in actual or anticipated contributions of about $1,250,000 toward support of research over a five-year period in this or closely allied fields in physics, chemistry, and chemical engineering. These contributions come from some six or seven industrial concerns.

A few unsuccessful attempts have been made to secure funds for other projects on our priority list. But, by and large, the over-all report to date is this: We have seen very specific immediate need for about $30,000,000, of which $20,000,000 is to be used for additions to our physical plant and $10,000,000 for additional endowment. More endowment is desirable, but these are our immediate needs. Of this $30,000,000, about $10,000,000 has been secured, leaving some $20,000,000 still to be secured.

. . . *As Others See Us* . . .

The results of such exploratory studies and fund-raising efforts were reported to our Corporation at its last December meeting, and the Corporation set up an *ad hoc* Survey Committee to make its own critical evaluation of the situation and to recommend to the Corporation appropriate action. This committee, under the chairmanship of John R. Macomber, '97,

(*Continued on page 526*)

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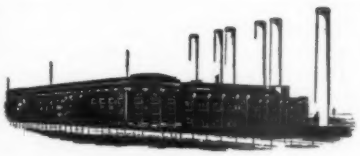
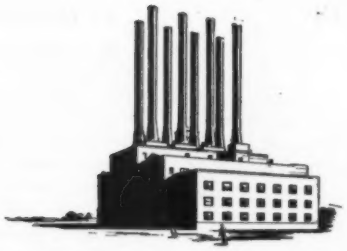
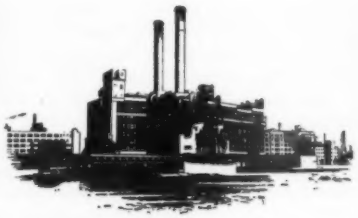


Lakeside Station,
Wisconsin Electric Power Co.
First utility power station to be designed for pulverized coal firing.



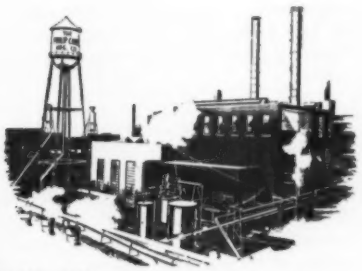
Rouge Station, Ford Motor Company
First industrial power station to be designed for pulverized coal firing . . . world's largest industrial power plant.

Kips Bay Station,
New York Steam Corporation
World's largest central heating plant . . . heats many of Manhattan's most notable buildings.

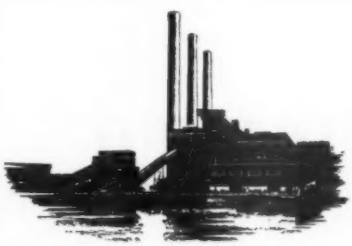


East River Station,
Consolidated Edison Co. of New York
First power station to install boilers capable of producing 1,000,000 lb of steam per hr.

History-making power stations

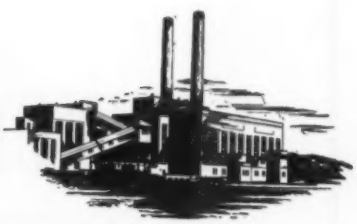


Lockland Plant,
Philip Carey Manufacturing Co.
First American plant to generate steam at pressure as high as 1800 lb per sq in.

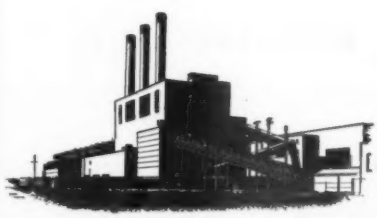


Port Washington Station,
Wisconsin Electric Power Company
Established efficiency standard for modern power station performance.

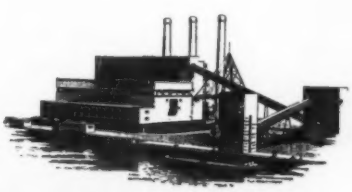
Waterside Station,
Consolidated Edison Co. of New York
Greatest power station modernization project . . . replaced 145 boilers with 10, and nearly doubled capacity.



Somerset Station,
Montaup Electric Company
First American power station to use forced circulation boiler.



Oak Ridge Station,
Clinton Engineering Works
Produced bulk of power for atomic bomb manufacture.



Sewaren Station,
Public Service Electric & Gas Co.
First power station to generate steam at temperature above 1000 F.

C-E

Collectively these ten great stations have pioneered much of the progress made in power-generating practice during the past quarter century. They are notable for many achievements and records in addition to those stated briefly in the titles. And they share one other thing in common. The records and pioneering for which they are known throughout the power industry were achieved with equipment designed and built by Combustion Engineering. B-205

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ALUMNI DAY, 1948

(*Continued from page 524*)

included: Marshall B. Dalton, '15, Joseph J. Snyder, 2–44, Thomas D. Cabot, Phillips Ketchum, Charles E. Spencer, James R. Killian, Jr., '26, Thomas D'A. Brophy, '16, Donald F. Carpenter, '22, Francis J. Chesterman, '05, Frank B. Jewett, '03, Duncan R. Linsley, '22, Gordon S. Rentschler (deceased), and George A. Sloan.

The energy and skill with which these men tackled their assignments were commensurate with their distinction as citizens and men of affairs. They made a unanimous report to the Corporation at its March meeting, and the Corporation voted unanimously to authorize the plan there recommended. I can best convey to you the conclusions thus arrived at by quoting sections of the committee's report, as follows.

"General oversight of the program of securing funds for the Institute is the ultimate responsibility of the Corporation. The organization recommended provides for a standing committee of the Corporation entitled the 'Committee on Financing Development' to implement formally this specific responsibility.

"The program to increase the endowment and plant of M.I.T. should be a planned, scheduled and organized effort to bring the Institute to maximum effectiveness. The short-range objective is to secure $20,000,000 over a reasonable period for immediate application to the several projects and endowment but the Committee on Financing Development should also arrange for a continuous directed effort to finance new or changed requirements as they arise in the future. It is suggested that the long-term activities include steps to promote the welfare of M.I.T. by encouraging and strengthening interest in the Institute among influential individuals concerned with the future of privately endowed institutions, and by stimulating the making of bequests to the Institute."

. . . *Organization* . . .

It is proposed to establish this widely organized Committee on Financing Development with representation from Corporation, Faculty, Alumni, and friends of the Institute. It will be headed by a general chairman, with a Steering Committee for top management, co-ordination and policy making, and will report directly to the Corporation. There are recommended a development office, and various special committees on such matters as projects, public information, alumni participation, resources, special gifts, business corporations, and local committees. This general framework may be modified and expanded as dictated by further thought and experience. Possible employment of professional help in fund raising was carefully explored, and left for decision to the new organization and the Executive Committee. The general spirit of the effort was described in the words: "While the immediate effort will not be a campaign or drive, the organization needs to operate with a sense of urgency and with effective publicity."

It was made clear that this plan is not to interfere with or temporarily supplant the Alumni Fund, which has so quickly grown to one of the most effective of its kind in the country and which must continue its present program of providing the Institute and its students, from time to time, with advantageous new facilities. You will recall that the Alumni Fund is made up of contributions by many thousands of Alumni in individual amounts between $1.00 and $1,000. The Committee on Financing Development will seek larger amounts from fewer sources. The report states that: "In the judgment of the Committee, all efforts should be made to increase participation in the Alumni Fund and the average size of gift with emphasis on proportionate giving."

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(*Concluded on page 528*)

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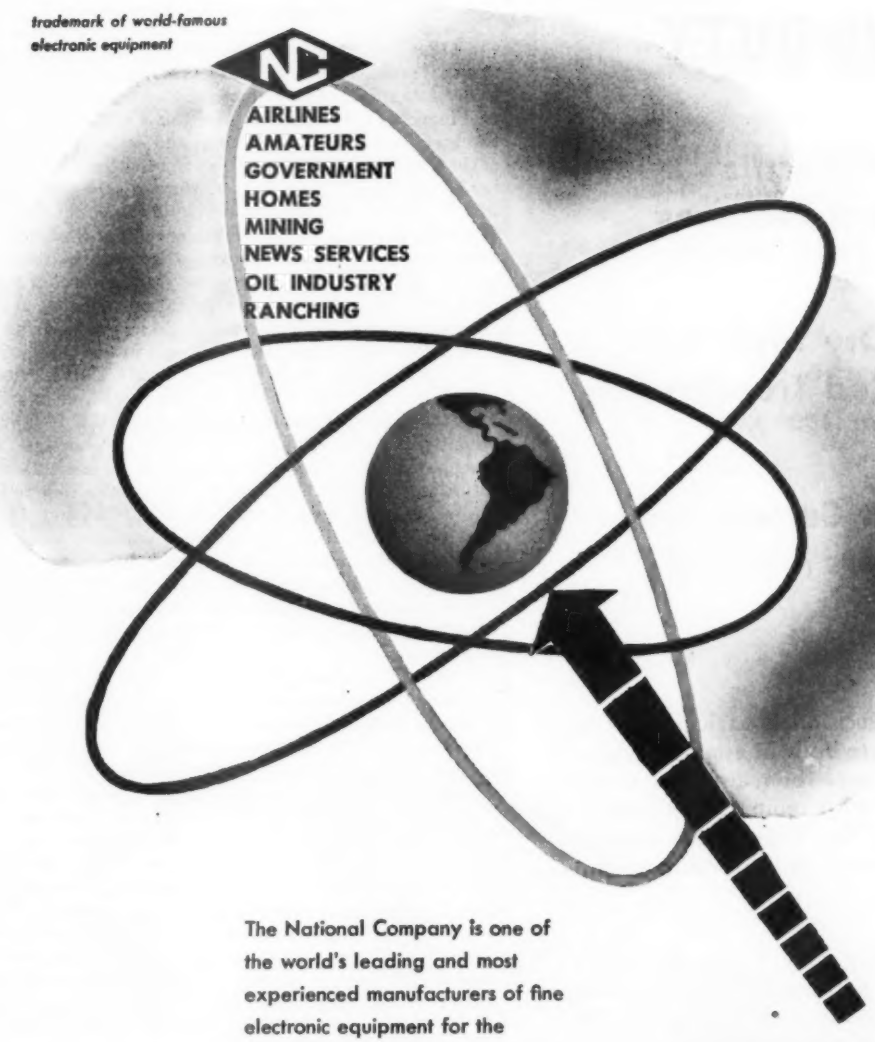

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ALUMNI DAY, 1948

(*Concluded from page 526*)

education the world over, it must be possible to solve our financial problem promptly. The first requirement is to find the leader and spearhead, the general chairman of the Committee on Financing Development. And this I am most happy to say has been done, to the unanimous and enthusiastic satisfaction of the Corporation and its Survey Committee. He is a life member of the M.I.T. Corporation. He is a past president of the M.I.T. Alumni Association. He is your good friend and mine, Marshall B. Dalton, '15, President of a Boston insurance company. Jack Dalton's company is generously freeing a large part of his time during the coming year to devote to the planning and organization of this operation in financial logistics. He believes that the preliminary spade work can be done in time for the actual operations to begin in the fall.

In conclusion let me make this comment. I realize that I have not given you a flowery after-dinner speech, or one sparkling with wit. Its recital has not been exciting. But, gentlemen, the potentialities of this plan and effort are exciting. As your imagination fills in the gaps and projects our institution into the future as you would like to see it, and as from time to time you receive progress reports or requests to lend a hand, I hope that your pride in the Institute and your ambition for it will grow by leaps and bounds. If what I have termed our "society of arts" should really put its potential power behind the Institute, it is as certain as anything in this world can be that the Institute would rise to new heights of service to the nation and education of its youth.

Finally, it is customary on this occasion to make a brief report on the aggregate of gifts which have been received by the Institute during the current year. As of this date, these gifts total about $1,950,000 in actual receipts. This does not include a substantial aggregate of pledges payable after July 1, nor of course does it include payments under contracts with our Division of Industrial Coöperation. We know of several gifts which will be received before the end of this month and which will bring the aggregate for the current fiscal year to a little over $2,000,000.

It is interesting to compare the trends in these gifts over the past 10 years. Since 1938 there have been received a little over $10,600,000 in capital gifts and a little over $4,200,000 in gifts for current operations, or a total of nearly $15,000,000. The capital gifts for any given year range between $465,000 and $2,042,000 and vary considerably from year to year depending on the addition of a few large gifts or bequests. The gifts for current operations, however, have shown an almost uniform upward trend, and their value of $809,000 this year is by a considerable margin the largest total for such purposes which has been received in any one year. This trend is most encouraging and is the only thing which has made it possible for the Institute to move ahead in its technological activities in spite of the increased level of all costs without a corresponding increase in income from endowment.

. . . ***Finale*** . . .

About 10:00 P.M., after everyone had agreed that they had enjoyed an outstanding series of events, Alumni Day, 1948, was brought to a close with the singing of M.I.T. songs led by Orville B. Denison, '11, Vice-president-elect of the Alumni Association, accompanied at the organ by Woolford Trembly.

Those who took part in the affairs of Alumni Day, 1948, may have had a strenuous time; some of them worked hard to assure the success of an alumni event which annually brings back to the Institute hundreds of graduates from all parts of the country, if not the world. But whatever their participation — from the most passive to the most active — all those who attended were enthusiastic and had high praise for the events of Alumni Day, 1948.

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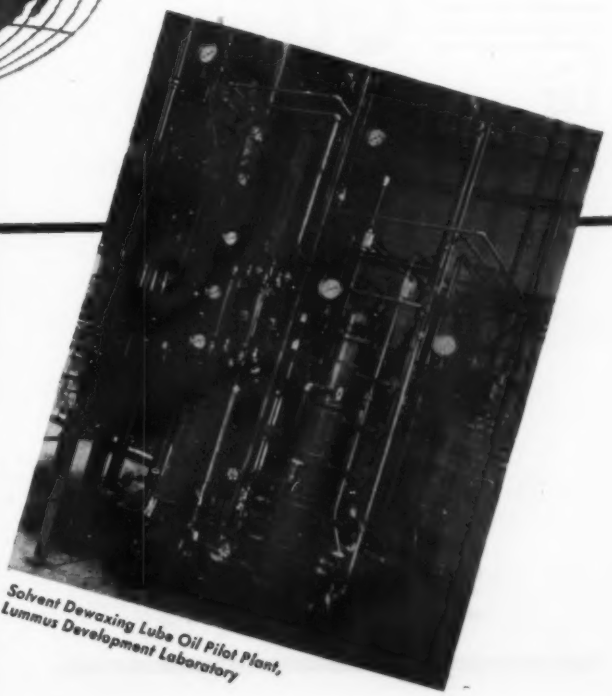

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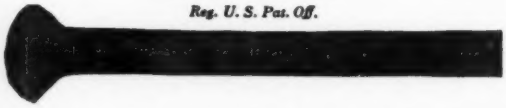

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EDUCATION FOR PEACE

(*Continued from page 503*)

the world needs to understand the rights and responsibilities of man in modern society. We speak easily of life, liberty, and the pursuit of happiness. We must remember that the only life that one values is a healthy life, with a sound body and mind; a life in which the individual is equipped with the skills, knowledge, and attitudes that fit one for taking a useful part in society. Liberty, in turn, means the freedom and ability to do what one wants to do, a freedom that can be allowed only when one is so trained that his wants are consistent with the welfare of his fellows. The successful pursuit of happiness implies that one knows what is good so that he can choose wisely the course that will bring satisfaction. Our great human goal is thus to enable every person to share effectively in the work of the world, each as his capacity permits. In performing this service, we grow to our fullest manhood. Progress toward this goal is in the direction of strength, prosperity, and peace.

It is then toward such objectives that education for peace must be directed. Citizens responsible for shaping the political pattern must learn what the factors are that tend toward peace and war, how war tensions can be restrained and how the forces of peace can be strengthened. All persons everywhere must be taught how to do effectively the tasks needed by their communities. The whole world must learn that in an atomic age our very survival depends upon working, not directly for our own interests, but for the welfare of our fellows, and that this law applies equally to individuals and to nations.

The establishment of peace is the world's problem. Yet the United States now carries a major share of the responsibility, and a significant contribution to peace can be made by you here today. The United Nations and its specialized agencies have been set up for enabling the nations to work together. I have recently attended sessions at Paris and Mexico City of the United Nations Educational, Scientific, and Cultural Organization. Last autumn 1,500 representatives of 39 nations were in attendance. Their answer as to how peace is to be established is clear: "Since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed." A program of concrete educational objectives is in hand, designed for promoting peace.

By far the greater part of the preparation for peace is, however, that being carried on by the various nations themselves. Because of the influential place of the United States in current world affairs, the attitudes and actions of our citizens become of extraordinary importance in setting the pattern of peace or war. Our own education, our own understanding of the world's problems and of our relation to them, our own ability to give the service that the world now needs, is perhaps of greater significance to world peace than that of any other nation. One reason for America's unique place in education for peace is that with the disruption of educational facilities in many parts of the world, we are called upon to train thousands of young men and women needed for key educational posts in the devastated countries. The great international educational service that Germany gave after World War I must now be supplied in large measure by the United States. The growth of industry and com-

(*Continued on page 532*)

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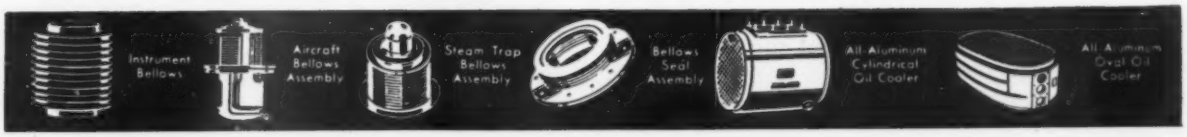

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EDUCATION FOR PEACE

(*Continued from page 530*)

merce on a world-wide scale depends greatly upon the advances in technology and science. In these fields the United States has become an acknowledged leader; the active pursuit of such studies in universities is vital to the development of society into a world community.

For more than a generation we, in the United States, have developed our educational programs around the need for training to do practical jobs. One result has been our development of the mightiest productive power the world has seen. The present dependence of the world on our surplus production demonstrates the great practical importance of such technical training. We find, however, that our greater need now is to find the goals toward which this great power can best be used. Knowledge of human values and of human motivations is thus given renewed emphasis. Old concepts of morals and ethics need to be refined, and evaluated afresh, and restated in modern terms. We have seen great nations, leaders in military might, in industry and culture, broken because of their failure to comprehend spiritual values. We thus look with renewed earnestness toward a development of religion appropriate to our age. It is our obligation to the world that the Titan powers of our nation be guided by the best understanding of human values, human motives, and human behavior that we can attain. It is to learn thus what it is that makes life worth living, and to build this knowledge into our lives that is now our supreme task.

The fact is that much of the world is deeply discouraged. People see that life in the atomic age means industrialization and technology. To us with whom such life is familiar, the associated changes may appear as a great adventure. But to civilizations long accustomed to a simpler society, the necessary emphasis on machines, and things, and the facts of science seems to imply by their neglect that such matters as beauty, and happiness, and friendships are of negligible importance. People dread the change in their way of living which is inevitable.

What they need is to be shown that modern life also has its human values. It is we, to whom this life is native, who must find such values first in our own lives, and then show our neighbors the opportunity present in the new world. Is not the distinctive opportunity offered by a technological society that of being able more adequately to give those around us the chance to live a well-developed life? Is not this the joy that is ours? As this aspect of the modern age becomes understood, hope will replace the dread that is now so widespread, and nations will approach the future with courage.

Here then are the distinctive tasks before us now: to develop in our own lives such human values that the world will approach the atomic age with courage; to cultivate the understanding of our fellows that makes for friendly relations; and to enter with joy into the task of giving others the best service of which we are able. Thus we will build for ourselves, happiness; for the nation, strength; and for the world, lasting peace.

It will not be easy. We have noted that education for peace is a world task. It is probable that once again, as in 1930, behind some iron curtain, there will be those who will educate not for peace but for war. It could be that this is in fact going on now. It is for such a test that we

(*Concluded on page 534*)

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EDUCATION FOR PEACE

(*Concluded from page 532*)

must prepare. I personally am confident of the ability of the free nations of the world, if they are determined to maintain their freedom as I believe they are, to withstand such dangers. The course is clear. We must maintain adequate military preparedness so that aggressors will be deterred from warlike plans, and at the same time build up the power of peace. This power consists of the harmony of purpose that comes from a common concern with the welfare of persons, the co-ordination of effort provided by suitable political and economic organization, and the choice by free men and women to make their lives abundant through effective service of their fellows.

We have made a good start. Whether from altruism or from enlightened self-interest, the great effort of our nation in spending its billions for the recovery of a continent, most of which only a few years ago was viciously seeking our destruction, is a great moral venture, as far as I know unparalleled in history. It promises to pay rich dividends toward establishing peace and very probably in building a strength and prosperity of the democratic nations in which we will share. But more and more effort is required. Recent faltering action by Congress in financing this reconstruction reminds us how we take the easy course when immediate danger of war seems relaxed.

Once again, as the wheels of history turn, it seems possible that lasting peace may be established before another war descends. The very warlike character of our international atmosphere makes us alert to the dangers to which a few decades ago we were blind. The chance has increased that, when the unfortunate accident happens which threatens peace and freedom, the world can weather the storm. The greatly increased danger inherent in war and the greatly increased importance to the world of maintaining a peacefully co-operative society call for a supreme and persistent effort during our generation.

Young men and women, you are entering into this struggle. You have already played your part in fighting a war to avoid the spread of an enslaving tyranny over our nation and the world. Now there lies before you the greater task of creating a system in which people can live with confidence in each other, working together to attain harmonious human goals. Each of you has prepared himself for his own field of service. It is in this task of yours that your immediate work toward building peace can presumably best be performed. But you must keep in mind also the farther goals. It is the responsibility of every person, but especially of every educated American, to make sure that in his work he is making his best contribution toward the life of the world community. This is the path to peace, to prosperity, and to greatness.

Previous generations have thus laid a foundation on which peace can be built. If you, in your generation, can now construct the framework of peace, the generations to come will develop this structure into a beautiful building fitted to a better life. That previous efforts to set up this framework have failed must not discourage you. The chance for success is now at its best. If you try and fail, at least you will have brought ultimate success closer. If you succeed, you will have made real the great dream of mankind. Vision and courage are the essentials. It is not the warlike world of the past that determines the future. Our future depends on what we aspire to become.

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ECONOMIC MEANS TO PEACE

(*Continued from page 500*)

need for adopting any decline in the standard of living; it will be even more unpleasant and exceedingly difficult for Europe to adopt the materially lower standard which the war has made mandatory. The new economic order must be faced realistically, however, if we are to have a viable peace. Thus, as our second problem, it is necessary to reconcile the loss of income from overseas investments, and the change in terms of trade between Europe and the food and raw material producers, with the maintenance of a reasonable standard of living in Europe.

The third task before us is the necessity of developing new sources of supply of food and raw materials.

As physical production ceases to be the bottleneck in European recovery, the fourth and final task is to make sure that Europe can market its industrial goods and, with the proceeds, provide a market for food and raw materials. Man-made institutions in the way of restrictive legislation, for example, should not be permitted to interfere with the free flow of goods to and from European countries. If Europe is not able to sell its products freely in a world market and thereby rebuild its own industries, European recovery will be still further handicapped and slowed down, and our own task of aiding European countries will be made so much more difficult.

The recognition of the problems confronting us is a comparatively simple matter. How to execute the tasks needed to carry out the reforms which will lead to recovery, is quite another problem. It is one which could be discussed at great length; even a completely inadequate discussion might easily extend far, far beyond the total time allotted for this entire symposium. But I do propose to outline, briefly, some possible means which might be put into effect toward the solution of the four main difficulties which confront Western Europe.

The accomplishment of the first of these four tasks requires, above all else, wise fiscal and monetary policies

(*Concluded on page 538*)

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ECONOMIC MEANS TO PEACE

(Concluded from page 536)

by the European governments, coupled with wisely used economic assistance from the United States. Great progress toward its accomplishment can be made within the next few months if the European Recovery Program can be carried forward with sufficient funds.

The key to the accomplishment of the second task is a larger increase in the productivity of capital and labor in European industry. I have already stated that the production in Europe is going along sufficiently well that it is no longer the major problem, but European productivity is pitifully low. And here I wish to make a distinction between production and productivity. Although the two terms may sound quite similar, there is a vast difference between them. Production refers to the total amount of goods manufactured, grown, raised, or otherwise produced; it is simply the total amount of goods without consideration of the manner in which it came into being. Productivity, on the other hand, refers to the amount of goods produced per person per unit of time. It is the time rate at which goods can be produced by human effort.

In Europe, the productivity — the rate at which goods are produced — is still lamentably low. Low productivity is the reason why Europe has not been able to resume its former position of more or less self-sufficiency and has come to this country in search of aid. Greater productivity is the only way for Europe to live within its means; it is the only way in which it can achieve the necessary social tranquility which it must achieve under its new economic order. Higher productivity means lower unit costs, which in turn means that more persons can afford to purchase goods previously denied them for economic reasons. But vast investments of capital will be needed to stimulate European recovery.

The accomplishment of the third objective likewise requires the investment of capital in the relatively undeveloped parts of the world. There is no doubt that the capital formation, the creation of new physical facilities and resources on a very large scale (both in Europe and elsewhere in the world) is physically and technically possible and that it is the necessary condition of healthy economic development in the world. The only major doubt about the feasibility of accomplishing this result concerns the channels through which the international flow of capital can take place.

The accomplishment of the fourth objective requires, above all, the pursuit of proper trade policies by our own government. To be sure, Europe will not be able to market its industrial products unless European productivity is high and European producers are able to compete with American. But this problem will largely solve itself if the United States balances its account with the rest of the world by both importing goods and exporting capital funds. There is every prospect that the United States can be permanently a heavier importer in the future than it has been in the past and that it can continue to be an exporter of capital. But this accomplishment in our economic position in the world could easily be frustrated either by reversal of our policy of reducing trade barriers or by failure to further international investment.

Through reasonably enlightened policies on our part, recovery and reconstruction can be assured. If we fail, it is much more likely to be through our own inability to act wisely than through the strength or skill of our enemies.

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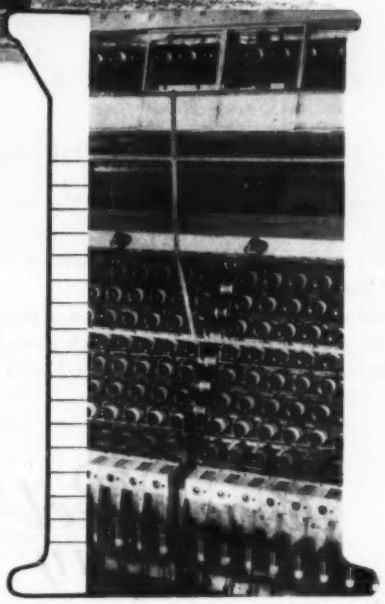

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WORLD ENERGY AND WORLD PEACE

(*Concluded from page 496*)

It is no accident that the daily production of petroleum in the United States is about seven times that of Russia. It is the American political system which has made such creative developments possible by releasing human energy.

As we look out over the world and ask ourselves how we can help the people of the world to achieve a standard of living which will afford a better climate for world peace, we must not ignore the fact that our own achievements took place in a political climate favorable to initiative and encouraging to the individual. It is by no means certain that the American people could duplicate their accomplishments under less encouraging conditions. It is by no means certain that anyone else can approximate such achievements without turning away from State-ism and toward freedom for the individual. I think our government is entitled to take that into account as it works to help foreign peoples. It seems to me certain that men must become increasingly free throughout the world, and individually must have increasing opportunities, if we are to achieve our material goals on a world scale. The force which lies in coal and oil and all the other forms of energy must be unlocked by the ceaseless enterprise of countless men and women driven by hope, drawn by opportunity, and free to act.

What we are all seeking is not a Pax Romana. That was a peace of exhaustion. What we are seeking today is a creative solution of the world's ills — conscious for the first time that man can exist in a single, world-wide society. Dr. Toynbee has made us aware that 20 civilizations have already existed on the face of the earth and that all of them except our own (he says "*possibly* our own") have failed to meet the challenge to solve the two eternal problems of war and class which, separately or together, have killed off all other civilizations. I think a society of free men is the best way to defeat both war and class. Perhaps we may succeed where others have failed.

It seems to me that we have nothing to fear so long as we are creative. Previous civilizations have died when their growth and expansion met geographical limits and they could go no further. What appeals to Americans, however, is not geographical expansion. Conquest does not attract us. We are attracted more by the creative opportunities which lie in sociology, technology, research, invention, and machines. I am not sure but what we may be the first great nation of the world to see clearly that high standards of living for others, are good for us; that any kind of slavery is a curse for master as well as it is for slave.

The "Logistics of Peace" raises no energy or raw material problems which cannot be solved, if we can expand opportunity in the world. The primary energy that the world needs, is energy of the human spirit. If we can break down the barriers of trade; if we can move continually away from independence toward interdependence; if we can use less and less often the devices of monopoly, public or private; cartels, and government restrictions on opportunity; if we can work continually toward a world society built upon the rights of the individual, I see no reason why we may not at last succeed, within the lifetimes of our grandchildren, in achieving a world civilization with a world peace.

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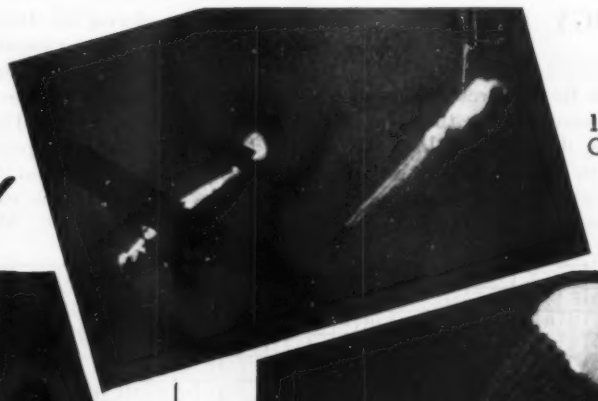
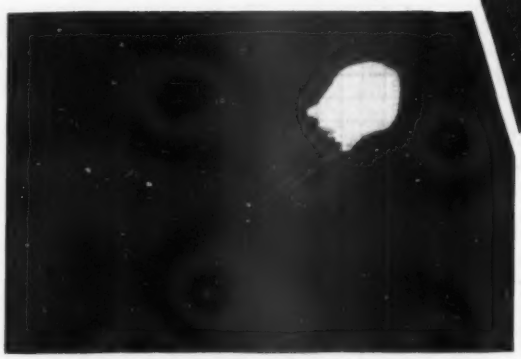
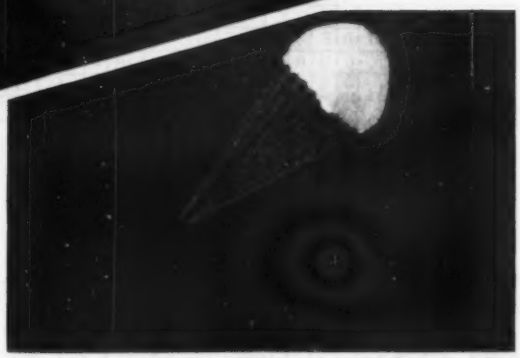


1 - AT INSTANT OF RELEASE

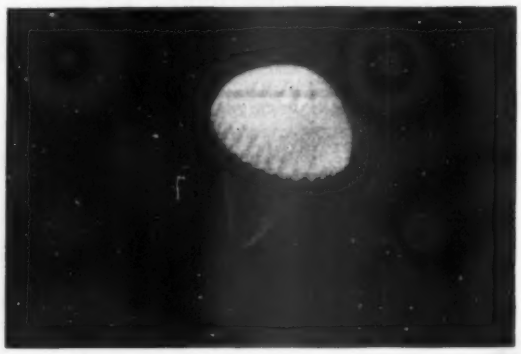


2 - PICKING UP THE LOAD, LINES ELONGATING

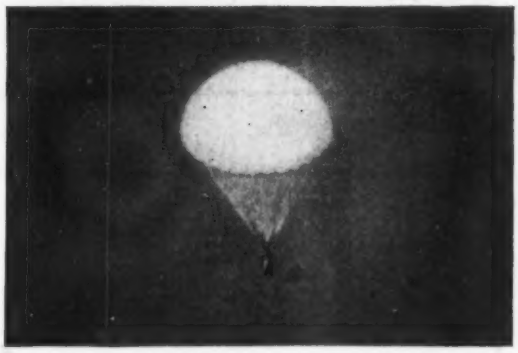


3 - SHOCK DISSIPATED, LINES RETRACTING

4 - FULL DEPLOYMENT, OSCILLATION DAMPENING



5 - STABLE DESCENT



DEVELOPED by Robert Taylor Dawes, (M.I.T. 1926) this new elastic shroud line quickly takes up the shock of the opening parachute, even though the paratrooper bails out from a plane going at high speed. Landing shock and oscillation are markedly reduced, and a 'chute shrouded with these elastic lines spills its air automatically, minimizing the drag along the ground.

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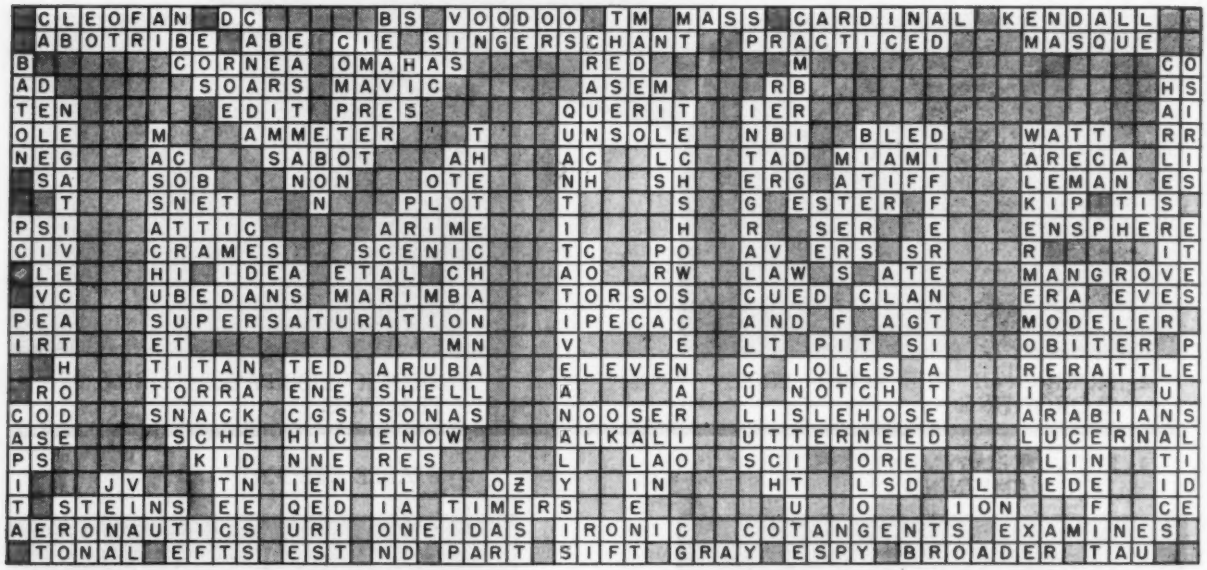
TECHNOLOGY CROSSWORD PUZZLE

LAST month The Review presented what is, for it, something of an innovation in the form of a Technology Crossword Puzzle designed by John M. Keck, '23. Of unusual interest to Review readers was the fact that the design obviously exhibited some of the letters and symbols to which every M.I.T. graduate has been exposed during his study of science or engineering at the Institute.

Not so apparent in the original diagram were a host of other terms and abbreviations whose locale is distinctly that of Massachusetts Avenue and the Charles River in Cambridge. These appear in the diagram below as a solution to the puzzle.

Those who like to check the results of their work with that of the experts will find comfort in the diagram, prepared by Mr. Keck, and reproduced below.



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Office Lighting Like Medicine is Truly at the Crossroads

By George Ainsworth, M.S., M.I.T., 1904

Professor Parry Moon '27 at M.I.T. and Dr. Domina Eberle Spencer '39 have perfected a revolutionary method of lighting computation, which can be used by practising engineers in designing high quality illumination for rooms where close work requires constant clear vision — (Delos 100%*).

The concept is founded on the interflection of units of light within the surfaces that enclose areas of any size. Illumination by this new system, at levels involving prudent expense, has the serenity and grandeur of natural light interflected by the sky, Fig. 1. The traditional assumption that the excellence of office lighting can be appraised by footcandles, is a persistent misconception, which has created a grave problem for management employing large staffs in huge working areas. The results have caused much dissatisfaction. Fig. 2.

Medicine has come to a respectable place in the world through the gradual elimination of loose practise, humbug and quackery. The lighting engineers of tomorrow will reach the respectable status of PREVENTIVE MEDICINE by striving for a scientific simulation of such levels of natural light, Delos 100%, as can now be duplicated with fluorescent lamps. There is no substitute for reality when it comes to physical well being. This new science avoids the injurious apparition of concentrations of light, Fig. 2, to which the old footcandle art aspired in reaching "the highest coefficient of utilization." This threadbare mechanistic conception, cannot be reconciled with the physiological requirements of the eye. Parodoxically, the highest utilization is the exact cause of blurred vision.

Footcandle levels as an appraisal of excellence are meaningless unless achieved by total interflection, called SPATIAL illumination. Eyesight is best served by a simulation of nature's spatial lighting at levels between twenty five and a hundred and fifty footcandles (lumens per square foot). At such intensities, natural light is delightfully free from shadow, because the origin of the radiation is a luminous continuum in the overhead, Fig. 3. The Ainsworth SPACIALITE (pat. 2,346,717) covers the artificial method of simulating the essential characteristics of natural light at the lowest cost.

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On Office Lighting

*See LIGHTING DESIGN by Parry Moon and Domina Eberle Spencer, published by the Addison-Wesley Press Inc., Cambridge 42, Mass.

EFFECTIVE LIGHTING

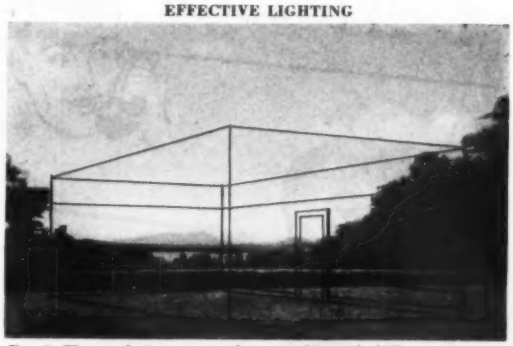
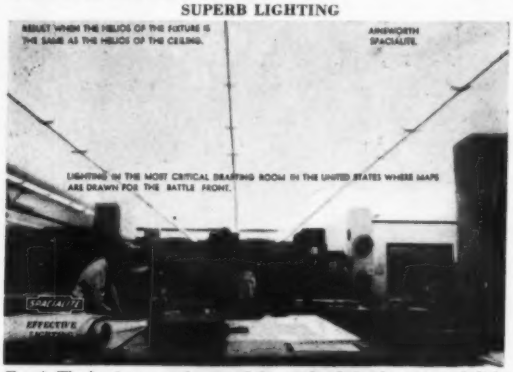


FIG. 1. The revolutionary procedure to achieve ideal illumination is to simulate a comfortable landscape panorama at the moment of daylight to be reproduced artifically. An imaginary room is indicated by transparent planes forming the walls and ceiling of the area to be built indoors. This natural light is shadowless, because its origin is caused by interflection in the atmosphere. Direct sun rays appear only at very much higher levels.

DEFECTIVE LIGHTING

FIG. 2. The old art to achieve the highest footcandles with the least wattage, is based on squirting units of light from spaced sources, instead of radiation by interflection from the entire visual field. The sensitivity of the retina is dulled because of the heterogeneous bright and dark overhead. Direct rays are reflected to the eye causing the image to be overlaid; vision is blurred. The lighting is unsatisfactory.

SUPERB LIGHTING


RESULT WHEN THE HELIOS OF THE FIXTURE IS THE SAME AS THE HELIOS OF THE CEILING.
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LIGHTING IN THE MOST CRITICAL DRAFTING ROOM IN THE UNITED STATES WHERE MAPS ARE DRAWN FOR THE BATTLE FRONT.

FIG. 3. The luminous continuum of the overhead simulates nature's light source. The light is spatial, it is entirely diffuse, because it is emitted in uniformly small amounts from *the entire artificial sky*, in this case, the ceiling of the room.

When management appreciates the value of light finishes on lockers, letter files and walls, the seeing conditions in such rooms will show a marked improvement.

As engineers better understand the principles of interflection set forth in the new textbook, LIGHTING DESIGN, the visual environment will approach the grandeur of natural light to which the eye was adapted by evolution outdoors.

AINSWORTH LIGHTING, Inc., 38-10 Twenty-Ninth St., Long Island City 1, N. Y.

DEFENSE, CO-OPERATION, PEACE

(*Concluded from page 498*)

if the time is not ripe for the cultivation of an attitude of mind, without which the achievement of those purposes may be impossible. Can we not meet the demands imposed by the present-day situation through approaching social and political problems in the same way that we have been dealing so successfully with the world of things? This would mean that, in striving for peace and prosperity, we must be open-minded and venturesome. We must rely on knowledge, and avoid emotion. We must think in terms of cause and effect, rather than in terms of causes and slogans. We must proceed with care, but boldly discard unworkable hypotheses. We should not resist change when change would bring us nearer the goal. Perhaps, above all, we must learn to prize the possession of personal and intellectual freedom, which is apt to be ignored because we, on this continent, have it in abundance.

After this excursion, which I hope may have something to do with the subject, may I now consider very briefly a few of the problems of 1948. A few years ago there seemed to be some hope of progress toward Wendell Willkie's *One World*. For the present, however, this hope is clearly denied. Another road toward peace must be sought. Should we not try to match the promise of economic restoration contained in the Marshall Plan, by a political effort of similar magnitude and vision?

Perhaps the time has come when serious thought should be given to the organic grouping together of the North Atlantic community. This idea is, in fact, suggested in a resolution which, I understand, is now being considered by the United States Senate, of which one objective is: "Association of the United States by constitutional process with such regional and other collective arrangements as are based on continuous and effective self-help and mutual aid, and as affect its national security." Such a step would offer the members of the North Atlantic community a greater measure of political security, and at the same time permit speeding the process of economic reconstruction throughout the democratic world.

This free association of free nations might, in the beginning, take the form of multilateral treaty of mutual assistance containing provisions for closer political, economic, and cultural co-operation, somewhat along the lines of the Brussels Treaty. In this atmosphere, the establishment of the beginnings of a genuine international legal order might be possible. Through economic co-operation, long strides could be taken toward the goal of higher living standards. Further than this, the universality of the United Nations and the aim of an eventually united world would not have to be sacrificed. The Atlantic community could formally come into being within the Charter of the United Nations under Article 51. The practical pursuit of a big ideal would help dissipate what James Reston recently described as the "curious present sense of fear" which prevails to some extent in the Western world. Its pursuit might well result in the wholehearted rejection elsewhere of the police-state philosophy, for what it is — a soul-destroying affliction born of apathy, doubt, and despair.

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URGE FOR A BETTER LIFE

(*Continued from page 505*)

universities, in any one of which I would have gladly cast my lot. I wrote 40 of the best letters which I could compose, applying for a position and setting forth my experience. The net result of these 40 letters of application was one offer of an instructorship at $600 a year. I felt very discouraged but finally the problem was solved.

Then I had a letter from one of my former professors at Princeton saying that he had recommended me for an assistant professorship at Yale University, and suggesting that I send in an application. I did so and at the same time wrote to the head of the Physics Department of Princeton asking if he would support my application. The result was that I got no offer from Yale, but I was offered a job on the faculty at Princeton which I gladly accepted. Finally, the chain of circumstances which landed me at M.I.T. involved, up to the very end, not the least thought, or even suspicion on my part, that this was to be my fate.

These experiences, plus many observations which I have had the opportunity of making in more recent years, have convinced me that there are some factors about securing a better job that are very important. The first is not to be too easily discouraged, and to this I should probably add the observation: "Don't be too overconfident." But the big lesson which I have learned through experience and observation is that if a job is continuously well done there will ultimately be far more people look-

(*Continued on page 548*)

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URGE FOR A BETTER LIFE

(*Continued from page 546*)

ing for you, and probably with more anxiety to get the services of some one like you, than any anxiety which you may have in looking for the job.

The feature which most impresses me in observing the filling of important positions is the fact that the determining factor is so often a characteristic which a candidate may frequently overlook. Perhaps I can best describe what I mean by saying that, after assuming that a man has made a good record of competent performance, the men who are really in demand and who are picked for the more interesting jobs are those who have a record of having given more of their services than they were paid for, given either to their employer or in outside activities in the community. I have seen this happen over and over again. For example, in Washington during World War II, many hundreds of outstanding men went there to serve in important posts for a dollar a year or less. Most of these men already had a background of service on various kinds of jobs, often exacting and unpleasant, on government committees, national associations, chambers of commerce, councils, and so on. They were men who had done something that put them in the category of giving more in the way of service than was required by the terms of their position. I think it is because of this quality that men of this character are so generally found in the most important and influential positions.

Consider now the urge to create, which is very basic. It is this which distinguishes a productive member of society from a social parasite. The basic importance of creative activity is implied in the reference which theologians of all religions so commonly use in describing God as the Creator. One of the major goals of education is to develop ability to create and one of the major features of a job is that it provides the opportunity to create. It is in this sense that the urge to create is more basic than the urge for education or the desire for a better job. If the creative urge is properly handled and developed, then matters of salary or advancement become secondary and generally take care of themselves. Fortunately there are many outlets for creative work, and for college graduates these run the entire gamut of business, manufacturing, financial service, engineering practice, architecture, law, medicine, agriculture, creative scholarship, education, — including every category of service required in all these operations and also including the supremely important job of homemaking.

Perhaps it is fortunate that no one of these various outlets for creative work is so appealing that all young people desire to go into the same line of activity. What a world it would be if, for example, all young men went into business. It would be as bad as if all young men wanted to marry the same girl, or if everybody wanted the same type of religion. Fortunately such extremes are avoided because people are just naturally of so many different types of character and ability. Some activities have a logical and emotional appeal to some people and not to others. Inevitably there is a great variety of outlets for this creative urge which is so fundamental to education and to success in any line of activity.

Finally, to sum up some of these thoughts very briefly, I think that all that I have tried to say can be summed

(*Concluded on page 550*)

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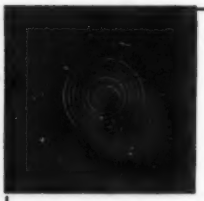
URGE FOR A BETTER LIFE

(*Concluded from page 548*)

up by quoting a verse from the Bible. I would preface this quotation by asking you to interpret it broadly. Think of the "Kingdom of God" not in terms of any specific theological doctrine but in the broad sense of a better life, emphasizing those aspects of sympathy, helpfulness, and service which were taught and exemplified by Christ. The verse is: "Therefore take no thought, saying what shall we eat? Or what shall we drink? Or wherewithal shall we be clothed? But seek ye first the Kingdom of God and his righteousness and all these other things shall be added unto you."

In the urge for a better life, which is the distinctive characteristic of the human race, the urge for education, the urge for a better job, and the urge to create are very important features. They are features which are particularly significant in connection with the educational program on which you have been engaged. But I hope that you will have carried away from this address the thought that neither education, nor a high salary for a job, nor any other feature of living is as important as doing a creative job which is of real service in the direction of a better world. "Therefore take no thought, saying what shall we eat? Or what shall we drink? Or wherewithal shall we be clothed? But seek ye first the Kingdom of God and his righteousness and all these other things shall be added unto you."

I would say finally that we who have come to know you during the past few years have worked with you with confidence in your ability to accomplish the type of life which we hope that you may achieve. We have confidence because we have seen this accomplished by others who have gone before you with similar backgrounds, training, and ambitions. And so, as you go forth, I bid you, in the name of the staff and of the Corporation and of the alumni body of this great institution, our best wishes and Godspeed.



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